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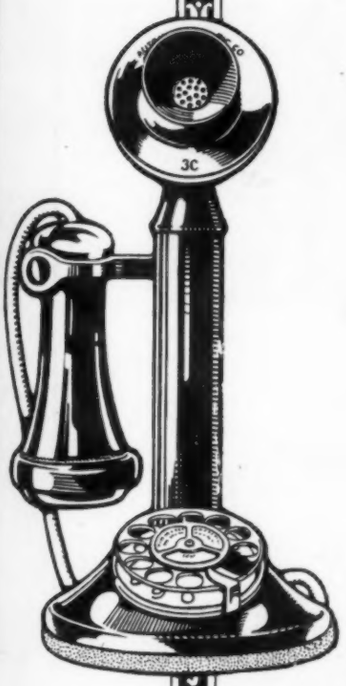
TELEPHONE ENGINEER

VOLUME 28 APRIL, 1924 Number 4



Progress

ONE of the guiding thoughts in the development of Strowger Automatic telephone equipment has been always to keep ahead of telephone service and traffic requirements—to anticipate the needs of the telephone business at all times.

How successful we have been is shown by the fact that the world's most prominent telephone operating organizations have adopted Strowger Automatic equipment for future installations in both large and small exchanges.

Just as the Strowger Automatic telephones and switchboards of twenty years ago set new standards of service and economy, so is the Strowger Automatic equipment produced today recognized as the most up-to-date and economical equipment that money can buy.

Companies that install Strowger Automatic equipment place at the service of their subscribers equipment that may be depended on to handle their requirements adequately over a long period of years.

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THE NEW CONVERTIBLE
DESK AND WALL TELEPHONES
FOR COMMON BATTERY MANUAL AND AUTOMATIC SYSTEMS

No. 114 Desk Set

Convertible Telephones

For Common Battery exchanges where a possible future change to automatic system is contemplated, it is a wise foresight on any telephones needed in the meantime to purchase these convertible types. The instruments here illustrated show many clever features of construction and adaptability to either system.

Automatic Dial

Any make of dial can be connected and mounted in a few seconds—on desk stand the dial is well over the center of the base, safe from knocks or damage.

No. 166 Wall Type

Neat, pleasing design. Double door steel cabinet—enclosed ringer gongs, safe from tampering. Slotted openings in the cabinet make the ringing of the gongs clearly audible. High efficiency transmitter and receiver. Adjustable transmitter mounting.

No. 114 Desk Set

Note simplicity of switch-hook construction. Stand with or without dial. Furnished with new enclosed gong bell box No. 167, similar in construction to the No. 166 wall telephone. Burns Rubber Ring on base prevents slipping of phone when dialing.

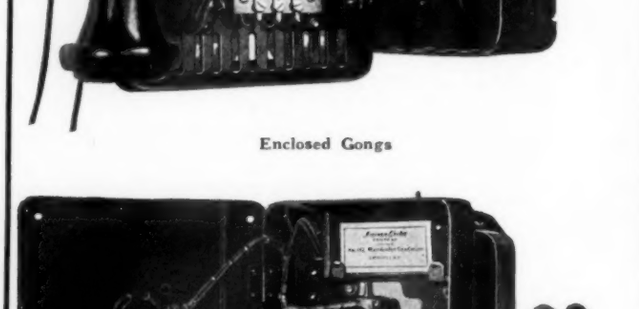
Accessibility — Standardization

Every part of these instruments is instantly accessible. Ringer adjustment can be easily made and permanently locked. **Large Booster induction coil.** Substantial removable switch-hook. Convenient line terminals.

American Electric
COMPANY
For Thirty Years Makers of Good Telephones
CHICAGO, U. S. A.

No. 166 Wall Set

Enclosed Gongs



Slotted Case

Let us furnish estimates and full data for your consideration

FULL LINE OF TELEPHONES AND SWITCHBOARDS

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THE RADIO BROADCASTING FIGHT

Some of the old timers of the telephone business will recognize a certain similarity between the present situation in the radio field and the conditions that surrounded the telephone industry in "those good old days" when the fight between Bell and Independent first began to wax warm. Ranged on one side is the American Telephone and Telegraph Co. and some forty "licensed" broadcasters. On the other side are some hundreds of "Independent" broadcasters. The Bell company has brought suit in a test case—as it explains—to protect its patents. The Independent broadcasters have come into the fray with the war cries: "Down with the Trusts," "There Shall Be no Monopoly of the Air." Sound familiar, don't they? In the meantime, the public looks on and wonders whether the static will interfere with tonight's program.

News and other reports have been so highly colored by the interests of the parties whose side is being told, that it is rather difficult to learn the exact facts. The Bell interests claim that the equipment used by the Independent broadcasters infringes patents owned by it. That there is more than a remote possibility that this is true must be admitted by anyone who is familiar with the contributions to the radio art of men in the employ of the Bell manufacturing branch. The Independents say that they can secure equipment only by signing a "license" agreement in which they agree to do no broadcasting for which a charge is made. About 40 radio transmitting equipments have been made and installed under this kind of a license arrangement.

If the Bell company owns valuable patents in the development of which it has spent large sums of money; if it believes these patents are being infringed, it has a perfect right under present laws to bring suit to protect its rights. On the other hand, if it is making use of its patent rights to control a service in which there is a large element of public interest, as in radio, it is doubtful if it can justify its action before the bar of public opinion.

If it is willing to manufacture equipment under its patents and is willing to sell the equipment to any purchaser at a reasonable price and without unreasonable restrictions as to use, no one can complain if it enforces its legal rights to the maximum extent. If the equipment made and sold by it is hedged round by license restrictions that interfere with the best use of radio service by the public, government regulation is sure to step in to prevent a monopoly of service—even if a monopoly of manufacturing is granted under the patent law. The people of the country have not entirely forgotten the "trust-busting" era.

TELEPHONE ENGINEER has said on many occasions that it considers the giving of commercial radio telephone service to be a function of telephone companies. To be of maximum use, it must be connected to and co-ordinated with the wire telephone service. This does not mean that we consider the giving of such service should be a monopoly in the hands of the Bell system or of any other group. We believe there should be no monopoly of the wire service to the extent that every telephone and every mile of long distance line be operated by the Bell. We believe the same thing about radio.

We have been of the belief that the Bell company learned a lesson out of its long fight with the Independent telephone companies, that would prevent it from ever again attempting to monopolize any side of the communication field. The present controversy will give us the opportunity to see if our belief is supported by fact.

FRICTION IN THE INDUSTRIAL MACHINE

When a new piece of machinery is placed in service, the bearings are tight and bearing surfaces are not worn smooth. As a result, there is a considerable amount of friction and a tendency to heat in spots. Gradually, the surfaces become worn smooth and the machine runs smoothly, without noise or undue heating of any of the parts. But, the smoothest running machinery must be lubricated and must have care. If the parts are not kept oiled and if dirt accumulates, soon the smooth surfaces are roughened. Then no amount of oiling will restore them to good condition. The machine must be shut down, the roughened surfaces scraped and polished, bearings must be taken up to compensate for wear and a general overhauling given before the machine will operate properly. When the machine is out of service for overhauling it means lost time and lost production.

The operating organization of a telephone plant may be compared to a machine, and the men in it compared to the working parts of the machine. Most of

these organizations are old enough that they should be running as smooth, well lubricated mechanisms. This is not always the case, however. Only a short time ago, an old-time telephone man in a talk before a convention called attention to the possibility of friction between inside and outside men. More recently, one of our friends told us of similar difficulties in a certain telephone exchange. Still more recently, we learned of an aggravated case where an executive found it necessary to step in and set things in order. In the latter case, this executive abandoned the "I would suggest" and "Please give this your attention" forms and laid down the law in such definite terms that the parties involved in the dispute were glad to escape without the loss of their jobs.

Wherever there is friction between departments or between people in the same department, there is bound to be waste of energy and inefficient operation. Small misunderstandings are bound to occur but they must be kept from becoming large misunderstandings. The industrial machine must be kept lubricated with the oil of co-operation. When trouble does develop, it must be cared for promptly, decisively, and with fairness to all concerned. If the trouble is not cared for when it first appears, a complete breakdown is almost inevitable.

SOME THOUGHTS ON THE BELL REPORT

A closer study of some of the figures of the latest annual report of the American Telephone and Telegraph Co. reveals some rather remarkable conditions. One of the features of pre-war reports was an analysis of operation on a per-station basis. This has not been featured in the reports that have followed the return of the property after government operation, but some interesting comparisons may be made by reducing the figures of the present report to a per-station basis, as undertaken herewith.

In 1916, exchange revenue was $30.49 and in 1917 $30.62 per station. In 1923, it was $39.51—based on the number of stations at the end of the year, rather than on the average number for the year. This represents an increase of approximately 30 per cent. Toll revenue increased from $11.75 in 1916 and $12.45 in 1917 to $17.15 in 1923, or about 40 per cent. Total revenue increased from $42.24 in 1916 and $43.07 in 1917 to $57.81 in 1923, making an increase in gross revenue of approximately 33⅓ per cent.

In the meantime, however, operating expenses, including taxes, have risen from $31.37 in 1916 and $33.77 in 1917 to $44.70 in 1923. The latter figure is slightly larger than the gross revenue of 1916 and 1917. Net earning per station has increased from $10.87 in 1916 and $9.30 in 1917 to $13.11 in 1923. The percentage increases in these items do not differ markedly from those of the revenue accounts.

The necessity for the increased net earnings is shown by the gradual rise of plant cost, per station, from its low point in 1916, when it was $146 per station, to its present figure of $190 per station. It is interesting to note that the average cost, per station increase, of plant installed since 1916 is $210. For 1923, the plant investment, excluding construction in process, amounted to $255 for every station gained.

A further analysis of the cost of plant installed during 1923 shows that the cost of equipment additions amounted to $121 per station increase. No doubt, a large part of this is due to the extremely high cost of machine-switching installations. There may be some relation between this fact and the entire omission of any mention of machine switching in the annual report. If the machine-switching offices are actually performing and realizing the economies that were expected from them, it would seem that the fact would at least be mentioned.

The large construction programs announced and the volume of unfilled orders of the Western Electric Co. indicate a further policy of expansion. With a constantly mounting cost per station this will make additional revenue necessary, even to a greater extent than will be gained by the normal increase in station growth. From all appearances, telephone rates will have to reach even higher levels than they have at present, or there must be some radical reductions in operating expenses which are not now in sight.

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ROTATION BILLING

In another column, we carry a story of the adoption of the plan of "rotation billing" by the Michigan Bell Telephone Co. This system of rendering bills at various dates during the month, instead of rendering all bills at the first of the month, seems to have many advantages for the larger companies. It has been in use for some time by other utilities and by banking houses, but this is the first case that has come to our attention where it is being tried by a telephone company. If the plan is successful in Michigan it will, no doubt, be widely adopted by larger companies.

Concerning Telephone Coils

This Chapter Describes Various Types of Telephone Coils; Resistance, Reactance and Impedance—Ringer Coils, Repeating Coils, Phantom Coils; How Made, Physical Properties and Applications

By P. Kerr Higgins

The induction coil as used in the magneto telephone already has been discussed. It is believed that the foregoing explanation of electro-magnetism will make its construction and application more readily understood. Some details of construction of various other types of coils will now be given.

As has been said, non-inductive coils have no iron used either as a shield (or cover) or as a core. They may be wound to any desired resistance to suit requirements.

Types and Uses of Telephone Coils

Judging by the comments of many of the readers of Telephone Engineer, there is a desire for further discussion of the use and purpose of different types of coils used in telephone work. The writer has endeavored to avoid highly technical matter in considering the various portions of the telephone plant, but in order to answer many questions that have been raised, and in view of the importance of a proper understanding of telephone coils, it is necessary to consider some of the technical features involved.

It would seem wise, at this time, to consider some of the terms used in connection with all kinds of coils so that when we come to consider them specifically, we may understand the meaning of the terms used. Three very common terms used in reference to coils and their effects in circuits are resistance, reactance and impedance. Resistance, as the term is used in connection with coils and conductors in this article, refers only to ohmic resistance, or to conductor resistance, and does not arise from static or magnetic effect. Two kinds of coils are used for resistance. One is a strictly non-inductive resistance; the other is a resistance coil in which only the ohmic resistance to the passage of the current is considered, although it is not entirely non-inductive. This is the ordinary type of coil without an iron core.

Some Ideas About Inductance

When a current passes through a conductor, there is at once set up a field of magnetic force around the conductor. This can be demonstrated by placing iron filings on a cardboard and laying on them a wire through which a current passes. Immediately the iron filings arrange themselves in concentric circles around the wire, indicating clearly the field of force in a manner similar to that of a magnetic body under the same conditions. There is one difference, however. If a bar of magnetic steel be used, then the magnetism is retained, but in the case of the conducting wire the magnetic effect disappears as soon as the current is shut off. The property of an electric circuit by which a magnetic field is set up commonly is known by the name of inductance.

Any variation in the current in the conductor will vary the magnetic field.

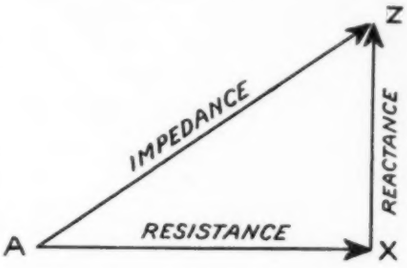


Fig. 1—Diagramatic View of Impedance

With every increase in current, the magnetic field abstracts energy, thus delaying the increase in current. When the current is decreased, the magnetic circuit returns energy, thus delaying the decrease in current. This effect gives rise to the idea expressed by "retardation" when applied to telephone coils. Another view of this action explains the process by the presence of a counter-electromotive force caused by the reaction of the magnetic field. This counter-electromotive force has a tendency to neutralize the original pressure or electromotive force. A simple illustration of this is found in the receiver. In front of the magnets is an iron diaphragm; on speaking into the receiver the sound waves produce vibrations in the diaphragm which, being in the fields of force of the permanent magnets will vary or cut these lines of force, setting up an electromotive force in the coils fixed on the ends of the permanent magnets. If the circuit is closed through another receiver, sound in the second receiver will show that a current is flowing. If the conductor is in a straight line, the field of force will be at a minimum. If, however, the wire is wound in a helix or coil formation, then a larger inductive reaction takes place. If the coil is wound on a magnetic core, then the maximum is reached for the reason that each turn of the coil will be cut by the greatest lines of force.

To determine how much this reactance amounts to, three things must be considered: First, the shape and construction of the coil; second, the frequency of the current used; third, the material used for core and shield. Its value is expressed in ohms just as resistance is expressed in ohms. If the inductance is known the reactance is equal to 6.28 times the frequency times the inductance or $X=6.28\ f\ L$.

Impedance a Combination of Resistance and Reactance

Impedance may be defined as the combined effect of resistance and reactance when both are present in the same circuit. They must be combined at right angles, however, and the following rule for determining impedance is given: On a sheet of cross section paper draw a horizontal line A X, to scale as shown in Fig. 1. We will assume this represents the resistance of wire or conductor; then draw to scale the line X Z at right angles to A X; this line represents the reactance, as found by the formula already given. Then connect the points A Z with a line which will represent the impedance. Now if the chart has been drawn to scale and the resistance and reactance are known in ohms the line A Z will be given in ohms and represents the impedance of the coil. These relations apply to alternating currents of high frequency, such as the voice currents used in telephone work. This law must be used for alternating currents, as Ohm's law does not apply in this case. The reason for this is that the value of current is not alone due to ohmic resistance, but to other obstructions as already explained. If we wish to use Ohm's law, we must replace resistance (R) with impedance (Z) and the formula would then read: $C=E\div Z$. Another method of obtaining impedance arithmetically uses the following formula:

$$\text{Impedance} = \sqrt{\text{reactance}^2 + \text{resistance}^2}$$

The introduction of impedance tends

to hold back the current from reaching its maximum value as soon as it would reach its maximum in a straight piece of wire; hence, the current wave is slightly behind the voltage wave and is therefore said to be lagging.

Wave Motion and Coil Winding Explained

To be strictly non-inductive, the winding must produce no magnetic effect. When wound in the ordinary way, the flow of a current of electricity through a coil produces some magnetic effects even if no iron is present. If

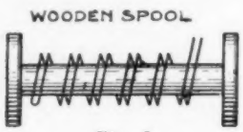


Fig. 2

it is necessary to wind a non-induction coil in the shop the total length of wire needed should be reeled off and then cut, doubled back on itself and the double wire wound on the spool as if it were one wire. This is shown in Fig. 2. Another method uses a pasteboard form instead of a wooden spool. The wire is wound on the form in the same manner, the whole coil is boiled in paraffine and while still hot the tube and wire are pressed flat. This makes a very good coil, having small area and very little inductance. Some telephone men wind a single wire on a wooden spool in a given direction, then put on a second layer in the reverse direction, the odd numbered layers of wire being in the same direction and the even numbered wires in the opposite direction to the odd numbered wires. An even number of layers of wire should be used in each direction so that each layer will neutralize the magnetic effect of the layer under it.

Ringer Coils; How and Where Used

Ringer coils are used in pairs and the resistance of the ringer is given as the resistance of both coils. In series work, coils of 80 ohms per pair are used; in ordinary bridging telephones, they run from 1,000 to 1,600 ohms, and on heavy lines up to 2,500. Straight line or non-biased ringers should ring on a current of from 0.005 to 0.010 ampere. Harmonic bells require from 0.015 to 0.030 ampere. The winding on ringer coils is straight winding to the required resistance. At times ringers fail to operate properly due to having a number of turns short circuited in the coil. Test for this may be made by measuring resistance of the coil.

Function of Repeating Coils to Preserve Balance

Repeating coils were born of necessity, when metallic circuits of toll lines were connected to grounded lines which were still in use locally. On these connections the lines were noisy. This led to the development and introduction of the repeating coil. Later the introduction of the common battery system being normally grounded necessitated the use of repeating coils either in the local or toll cord circuits. Repeating coils also are used in some common battery systems to provide a path for voice currents between subscribers. They are also used in composite work when telephone and telegraph are used over the same line.

The principal function of a repeating coil is to keep the line balanced. A balanced line is one in which both sides are of equal resistance and equal insulation. This is necessary to neutralize inductive influences from outside disturbances. At first the metallic lines were not transposed, but later as the service developed transpositions became absolutely necessary. As transposing applies to the line circuit, this will be discussed later. It is apparent that if we connect a grounded line direct to a balanced metallic line, the metallic line immediately becomes unbalanced and is noisy. By introducing the repeating coil, the balance of the metallic circuit is retained and the voice currents are transferred between the metallic and the grounded line by induction. This gives the name repeating coil because the coil repeats by induction the originating current or voice wave. A repeating coil in its simplest form is made up of two bobbins or spools, each containing a large number of turns of insulated wire. The core is made up of No. 24 iron wire .01 in diameter, well annealed, and the ends are doubled back to form a closed magnetic circuit. Another form consists of four separate coils wound around an iron core. The output of such a coil will depend upon: (1) the number of turns in the primary and secondary; (2) the strength of the current; (3) the frequency of the current. By arranging the coil into four separate sections, it is possible to make several combinations and several different uses of the coils, whereas if only two sections are used, then only one combination is possible.

Different Kinds of Repeating Coils; How Made

The repeating coil may be designed for talking, ringing or both. Because of the necessity of repeating low frequency current a coil designed for a combination of ringing and talking or for ringing only has more iron and is bulkier than one used for talking only. A coil designed specially for ring-through purpose would be very poor for talking, hence a coil must be designed which, while efficient for ringing, will not materially affect the talking. However, there is a loss in talking efficiency in any repeating coil and therefore they should be used only where absolutely necessary. The core of finely annealed iron wire or sheet steel should form a closed magnetic circuit to avoid leakage of cross-talk between coils placed alongside of each other. Some types use an iron ring for the core. Usually the two windings have the same number of turns so that primary and secondary do not have the same significance as in the ordinary induction coil. Good repeating coils will show a minimum loss under ten per cent, while poorly designed coils often run as high as thirty per cent. It is claimed that coils should be specially designed to work in conjunction with lines of a given resistance. However, in practice, this is not done except where loaded lines are in use. The iron core should have the minimum hysteresis and eddy current losses. The coils are usually so arranged that the inner coil of one side is connected to the outer coil of the other side, hence the primary and secondary consist of an inner and an outer coil, thus equalizing resistance to a certain extent. In some types of repeating coil, the two windings on the switchboard side are wound separately and the two windings on the line side are wound in parallel. Great care must be taken in connecting up a coil of this type in the proper manner. Attention to this was called by D. E. Wass in Vol. 27, No. 4, and the

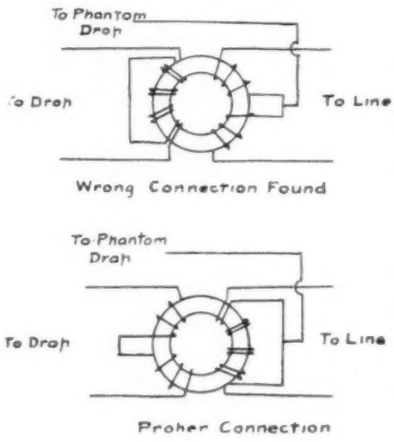


Fig. 3

connections shown by him are reproduced in Fig. 3.

Facts About Phantom Coils; Their Qualities and Uses

It is considered good practice to have phantom repeating coils arranged so that they readily can be cut out temporarily for testing purposes. This is usually done by jacks when a test panel is provided; otherwise switches may be used. Protection against lighting, etc.,

should be provided between the line and the coil; otherwise the coil is liable to be damaged. A method of connecting up phantom repeating coils through a test panel and with switches is shown in Fig. 4. Fig. 5 shows a connection

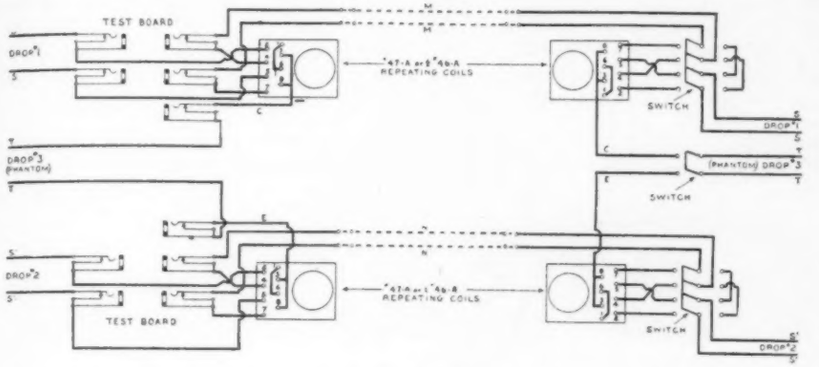


Fig. 4.—Actual wiring of Phantom Circuit for magneto lines, connecting two exchanges

for long magneto subscribers' lines. These circuits are designed for the use of Western Electric Co. repeating coils No. 46A and 47A. On rural lines the use of the retardation coil as shown at the end of the rural line in Fig. 5 gives very satisfactory service. The only coil of this type known to the writer is the No. 5-AF of the Western Electric Company. Repeating coils and retardations of makes other than these and designed in a similar manner can be connected up in accordance with the circuits shown provided proper attention is paid to the connections of the coil itself. It should be remembered that when repeating coils are used in connection with physical circuits the efficiency of the physical circuits is decreased, while a phantom built up on physical circuits usually gives better transmission results than the physical. The standard of transmission in the repeating coil should be less than one-fifth of a mile of No. 19 gauge cable per coil on the phantom.

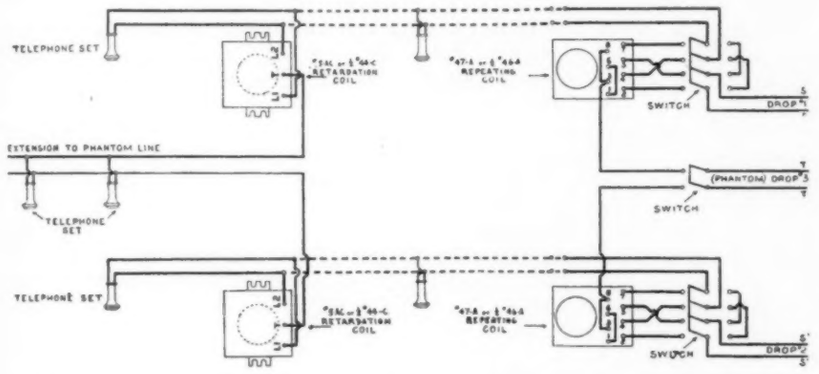


Fig. 5.—Actual wiring of Phantom Circuit for long magneto subscriber lines

Our Literary Digest

Review of Recent Articles on Telephony and Allied Subjects

Galvanomagnetic and Thermomagnetic Effects, by L. L. Campbell, Longmans, Green and Co., New York.

Some of the most interesting phenomena of electricity and magnetism are the Hall effect and some of the allied effects that have been discovered since Hall first published his discovery in 1879. Briefly described, the Hall effect occurs when a current of electricity passes through a metal plate. If there is no magnetic field present it is found that points of equal potential on the plate are at different places when no field is present. A number of explanations have been offered, but none of them are entirely satisfactory. The present monograph outlines all of the leading theories. It is too specialized for the ordinary reader, but it will have particular appeal to physicists who are in the forefront in scientific investigations of electrical and magnetic phenomena involved in the problem of atomic structure and interatomic relations.

Electricity and Magnetism for Advanced Students, by Sidney G. Starling, Longmans, Green and Co., New York.

This is the fourth edition of this standard English text book on electricity and magnetism. It is a book of advanced rather than elementary character and is most suitable for students whose mathematical equipment includes the calculus. The exposition of fundamental physical facts is very clear and the book lends itself very well to serve as a general reference work. The general plan has not been changed from that of previous editions but the latter part of the work has been largely rewritten to bring it into accord with developments of the last ten years, particularly in connection with the modern theory of the atom.

Alternating Currents, by Albert F. Clayton, Longmans, Green and Co., New York.

This book, an elementary presentation of alternating current circuits and machinery, is another English publication. It is intended as a first book for university students and for students in technical schools. The treatment follows orthodox lines and is as complete as the scope of the work demands. To the American reader, some of nomenclature may seem strange, particularly the use of the term "virtual" value for the root-mean-square value of an alternating current wave in the place of the term "effective" value commonly used here. The term "wattless," referring to the quadrature component of an alternating current wave has practically disappeared in this country, and, as far as has come to the attention of the reviewer, the term "wattful," applied to the in-phase or power components, never has appeared in the literature of alternating currents in America.

"Measuring Methods for Maintaining the Transmission Efficiency of Telephone Circuits" by F. H. Best. Journal of the American Institute of Electrical Engineers, February, 1924.

This paper presents a brief description of the methods of measurement that have been developed to insure the maintenance of proper transmission conditions of telephone circuits and apparatus. This has become a very important matter with the increase in length and complexity of the circuits that are in daily use for commercial service. The simplest tests are talking tests but it is very difficult to make accurate comparisons by this method. Many circuit parts have losses less than the probable error of this type of test. The losses in the ordinary telephone circuits are not constant with changes in frequency but for routine testing it has been found that measurement at a single frequency gives sufficient information. When it is necessary to have an accurate picture of the distorting effects of the line it is necessary to

make a number of measurements over the entire voice frequency range.

Among the testing means, the artificial cable talking test has gradually gone out of use and other measuring instruments have been substituted. Descriptions of several of the testing sets now in use are given in the paper. In the more highly developed sets, currents or voltages at the two ends of the circuit are measured directly and the ratio expressed in terms of miles of standard cable. Oscillators of the vibrating reed type of carbon button generator, inductor-alternator and vacuum tube generator are also described.

Review of Recent Articles on Telephony and Allied Subjects. "Certain Factors Affecting Telegraph Speed," by H. Nyquist, Journal of the American Institute of Electrical Engineers, February, 1924.

In this paper are discussed some of the factors which affect the speed of sending telegraph signals. The two principal factors covered are the effect of the shape of the signal wave and the choice of a code in which the signals are transmitted. The author concludes that the signal produced by transmitting a rectangular wave through a net work which rounds off the corners is the best wave shape. The effect of the number of "current values" on the speed of signalling by various codes is discussed. The discussion is applied to land lines, carrier current systems, radio telegraphy and submarine cable telegraphy.

New work of the Bell Telephone System in Florida during 1924 will amount to more than $1,191,500, according to officials. This equals the investment made last year, which was the most active construction program ever undertaken by the telephone company in that state.

Additions and extensions to the Bell telephone system in Mississippi this season will amount to more than $904,000. Additions and extensions to the Bell System in Georgia during 1924 will amount to more than $2,184,000.

Extensive improvements for the Port Arthur, Tex., telephone system will be completed this year by the Southwestern Bell Telephone Co., providing facilities for 3,550 subscribers here.

Crane, Mo.—Crane Telephone Co., Dee A. Rice, Sec.-Mgr., will rebuild 15 miles of rural lines this season and replace some open wire in town as well as do some cable work. Supplies required: iron and copper wire, poleline hardware and cable.

More Work for Fords

Ruckstell Axle Extends Scope of Ford Work in Telephone Industry—Carries Poles

Seattle, Wash.—Fords in the service of the Pacific Coast public utilities companies are beating the lowly ant out of its reputation of being the greatest hauling agent in the universe, size considered. A rear axle, developed in a Pacific Coast factory, is getting a great run on the Ford utility trucks in this section. The performance of this axle, the Ruckstell, may be appreciated from the photograph herewith, which shows a Ford, Ruckstell equipped, hauling 4,200 lbs. of 50-ft. poles over a prairie.

A Ford with Ruckstell axle hauls 4,200 lb. pole load

A Sensible Suggestion Regarding Pole Butts

In the Traveler's Standard, "A Magazine Devoted to Safety—Its Theory and Practice," published by the Travelers Insurance Co., are frequently found suggestions regarding safe practices that may well be applied in the telephone plant. In the February number is a suggestion regarding pole butts to which telephone plant men might well give attention. It is pointed out that road-making gangs are accustomed to fit the concrete or other pavement closely around the butts of poles encountered along the highway. This also happens when sidewalks are relaid or are widened. As a result it is impossible to make the periodic examinations necessary to determine if the pole is in good condition. In discussing this, the writer of the suggestion has the following to say: "When conditions are as outlined above and examinations are impracticable, the added hazard to the lineman enters. This is no vain imagining, because we have records of a number of instances in which poles have snapped off at the base while linemen were at work at the top. The careful lineman uses his safety belt to prevent his falling from the pole he is on, but when the pole itself falls he has no option but to go with it. In fact, the belt then increases his hazard, because it is likely to hinder any efforts he may make to escape injury.

"There is a very simple remedy, of course, because all that is needed to guard against this hazard is to omit the concrete or asphalt for a sufficient space around the pole to permit the owning companies to make regular inspections without prohibitive cost. Such a practice would inconvenience no one, except possibly a pedestrian who might stumble if he unknowingly stepped into the free space. In order to do this, however, he would have to walk so close to the pole that in all likelihood he would bump into it. If an auto driver should be so careless or unwary as to drive close enough to the pole for his front wheel to enter the depression, he would find the pole offering strenuous opposition to the fender before the wheel got into trouble.

"Besides, there is no need of having a depression, anyhow. There is no law against filling up the space with earth and even rounding it over so that the pedestrian and auto could not experience the least difficulty."

This sensible suggestion will appeal to the telephone plant man from another angle, namely, the removing and replacement of poles which would be possible without breaking out and replacing expensive pavement. There is little doubt that city and state highway authorities would be glad to cooperate in this matter.

Camas, Wash.—The Camas Telephone Co., C. W. Vail, mgr., is interested in buying used Kellogg and Western Electric instruments in first class condition.

Clarinda, Iowa—Farmers' Mutual Telephone Co., F. M. Lantz, mgr., is moving to new offices, and is engaged in a construction program which puts it in the market for cable, conduit, poles and pole line hardware.

Stockholm, Sweden—An automatic telephone system invented by a Swedish engineer, Mr. Hultman, is being tested at an experimental exchange in the Vasastad, in Stockholm. Another automatic system is to be tried at Sundsvall.

Murphysboro, Ill.—Extensive improvements are planned by the Southern Illinois Telephone Co.

Detection of Radio Waves

The Crystal Detector, the Simplest Device for Causing Reception of Radio Telephone Signals by the Telephone Receiver, Is Explained in Easily Understood Language. Circuits Are Given.

By R. T. Cloud

In order to receive radio telephone signals it is not sufficient to place the telephone receivers in the antenna circuit in the same way the receiver is placed in series with the line in the wire telephone system. Even if a means is provided for tuning as indicated by the coil in Fig. 1, and the circuit tuned to the incoming waves, no sound would be heard in the receiver. The reason for this is threefold. In the first place, the large number of turns on the electromagnets

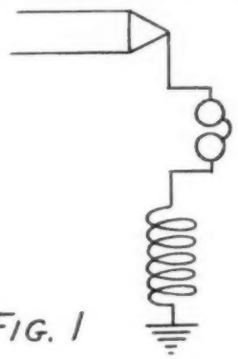


FIG. 1

of the receiver will present such a large impedance to the radio frequency current that its passage will practically be prevented. Even if sufficient current did pass through the coils, the diaphragm has enough inertia that it would not respond to the radio frequency impulses. Finally, if both these difficulties could be overcome, the human ear would recognize no sound as frequencies above 20,000 vibrations per second can not be heard. Therefore means must be provided for producing changes in current that occur at audible frequencies in order to operate the telephone receivers.

This operation is known as detection and is accomplished in general by two methods, crystal and vacuum tube. Each of these methods are extensively used in modern radio engineering practice and they are often used in combination. The vacuum tube is often used as an amplifier of either radio frequency or audio frequency currents with the crystal as a detector. The phenomena of detection is essentially that of rectification as will be further explained. This rectification may be fairly complete in the case of a good crystal or in the case of the vacuum tube rather incomplete but accompanied by amplification which compensates for incomplete rectification.

Modulated Waves

Before further describing the detector action it will be well to analyze the character of a voice modulated radio wave. The best way to understand what is meant by a modulated radio wave is to picture a generator of

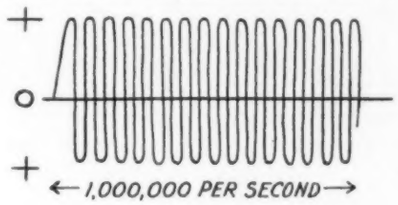


FIG. 2

a continuous output of waves at a certain frequency, say 1,000,000 per second. This wave will be something like Fig. 2. Now, no matter how weak or how strong this wave is it always vibrates at the same frequency, namely, 1,000,000 per second. This is similar to a pendulum when vibrating at its natural period; regardless of whether the stroke is short or long the time for a complete stroke is invariably the same.

If such a generator radiates a strong wave a loud click will be heard at the receiving station and if a weak wave a weak click will be received.

Now imagine a voice controlled valve that strengthens or weakens output of the generator in accordance with voice frequencies, the radiated wave will then have a form somewhat as shown in Fig. 3.
This wave will have two components,

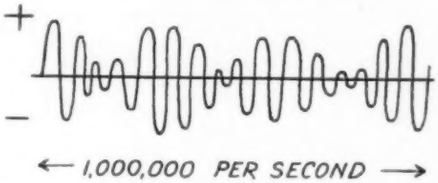


FIG. 3

the first is the carrier current component at 1,000,000 cycles per second. This is the wave that the receiver must tune to in order to receive the sending station. The second is the voice frequency component in accordance with the transmitting modulation.

The problem of detection is to separate the voice current component from this complex wave and allow it to actuate the receiver diaphram.

As previously outlined the high frequency alternating current of the carrier wave will not actuate a telephone receiver. However, if we place a rectifying device in series with the receiver so as to cut off one-half of the wave our modulated wave is as shown in Fig. 4 and as all the high frequency impulses are in the same direction they

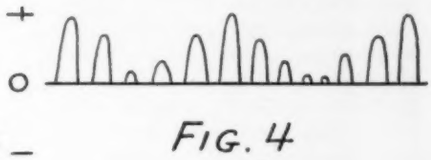
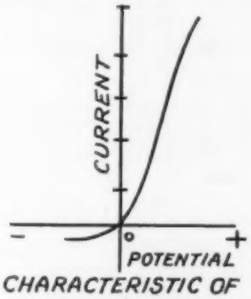


FIG. 4

will combine to actuate the telephone diaphram in accordance with the voice modulation.

Crystal Detectors

It has been found that certain mineral crystals have the property of unilateral conductivity under certain



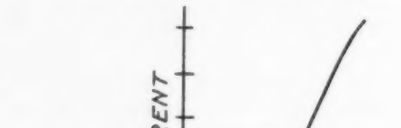
CHARACTERISTIC OF GALENA CRYSTAL

FIG. 5

conditions. This is illustrated in Fig. 5, for the case of galena or lead sulphite in contact with a sharp bronze wire. It will be noted that much more current passes through the contact in one direction than in the other. Crystals may roughly be divided into three classes, first those requiring a light contact with a sharp wire rectifying at zero bias potential. In this class are galena, silicon lenzite and cerusite. This type of crystal is very sensitive but has the objection that it is only sensitive in spots, it is often diffi-

cult to find these spots and the light contact of the "catwhisker," as the wire point is known, is easily knocked off from the sensitive portion.

A second type of crystal of which carborundum is an example, requires a biasing battery to obtain the best point for rectification. A characteristic curve of this material is given by Fig. 6 It will be noted that the point of



CHARACTERISTIC OF CARBORUNDUM CRYSTAL

FIG. 6

greatest curvature is at a point 1½ volts positive, this is the point of best rectification and varies on different specimens from 1 to 2 volts. The methods of obtaining this bias potential is by means of a few cells of battery and a potentiometer as shown by Fig. 7. The carborundum detector is not

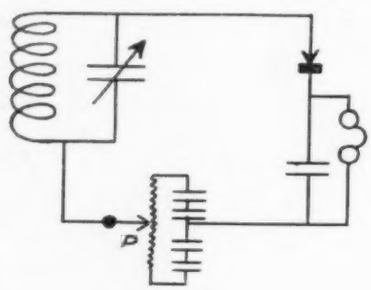


FIG. 7

so sensitive as galena, but the hard surface of the former allows a more permanent adjustment of the contact point which makes it a more reliable detector.

The third type consists of two dissimilar crystals in contact with each other. The Perikon detector is a trade name given to a combination of crystals of zincite and chalcopyrite. This type of detector requires considerable pressure between the elements and makes an excellent detector for use in portable sets and on shipboard.

Crystal Detectors Distortionless

As the crystal detectors fulfill only one function, that of rectification, and do not oscillate or amplify as in the case of vacuum tube detectors, they give excellent quality in reproducing radiophone music and voice. For this reason, they are often used in conjunction with both radio frequency and audio frequency vacuum tube am-

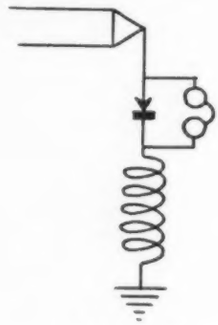


FIG. 8

plifiers. In using a crystal with radio frequency amplification it is well to select one of the more sturdy types, such as the Perikon. The more sensitive catwhisker type will not pass the large amount of current without overheating the point of contact and destroying the rectifying property.

If the receiver in Fig. 1 was shunted

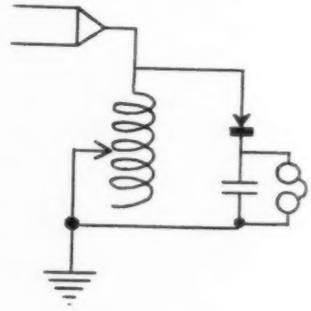


FIG. 9

by a crystal detector as shown by Fig. 8, one-half of the wave would be bypassed by the detector and the other half will be shunted through the receiver, so as to actuate the diaphram and cause sound. However, the receiver is not often connected directly in the antenna circuit in the manner

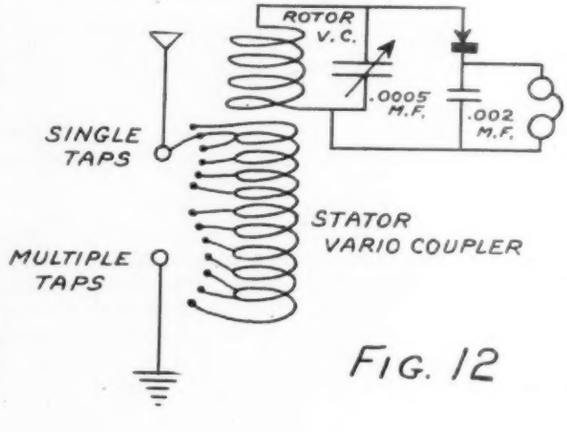


FIG. 12

indicated because the high resistance introduced does not permit of sharp tuning. A much more common arrangement is that shown in Fig. 9, where the aerial tuning inductance is shunted by the detector and receiver combination.

A still better arrangement is shown in Fig. 10, where the secondary circuit is inductively coupled to the aerial tuning inductance. This arrangement

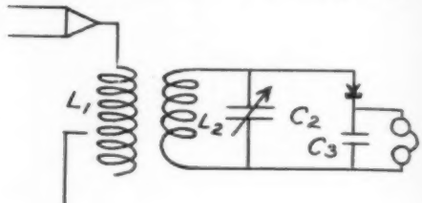


FIG. 10

permits the secondary tuned circuit to have a low resistance with a consequent sharpness of tuning. The oscillatory current generated in the tuned secondary L_2 C_2, creates a potential across the condenser C_2. This potential is used to operate the detector and receiver combination which is bridged around condenser C_2.

The condenser C_2 which is in multiple with the receiver, receives the

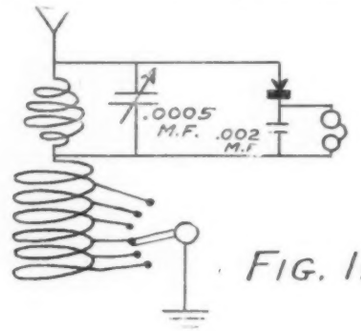


FIG. 11

minute rectified charges and is charged thereby. These charges leak off through the receiver thereby actuating it in accordance with the audio frequency component of the complex radio wave. Many sets work without this condenser, which should have a capacity of .002 m. f., however, the receiver cords act as a condenser in such cases. This capacity of the receiver cord is usually not sufficient and the set will work better with the condenser.

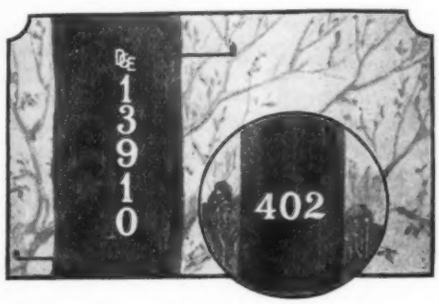
Owners of vacuum tube sets frequently look upon the crystal detector set as a mere plaything. Some of the wiser and nondiscriminating radio fans, however, have a real preference for the crystal set on account of its freedom from distortion, tube noises and howling, usually present in regenerative tube

sets. Where long distance is desired one or more stages of radio frequency amplification can be placed ahead of the crystal detector.

When carefully built sets are capable of receiving modern crystal broadcasting stations regularly for upwards to 100 miles during the winter months and often reception is reported for distances of 500 to 800 miles when conditions are right.

Fig. 11 gives an exceptionally sensitive arrangement where great selectivity is not desired. In this arrangement the variocoupler in the aerial circuit has a variometer action in tuning the aerial circuit, the rotor being tuned by the variable condenser VC to operate the detector and receiver combination.

Fig. 11 shows a more selective circuit in which the rotor of the variocoupler is removed from the aerial circuit. The stator of the variocoupler should have taps for both single and multiple turns employing two sets of switch contacts as shown in drawing. In operating this set the more nearly the rotor is turned at right angles with the stator the more selective the set will be, the selectivity, however, being secured by reducing the volume.



He tells of four distinct advantages

Recently an official of a large Public Service Corporation made these observations when discussing our PREMAX Aluminum Letters for pole marking, which outlasts the pole itself:

"We find it difficult to get proper labor for the job of stencilling the new poles, because the work does not warrant the wages of a high-priced man and efficient boys or cheaper labor are hard to obtain. We believe by adopting your PREMAX Metal Numbers and having our linemen number the poles when they are set, we can show a material saving in cost and be sure of legible and durable marking."

Quotations, sample numbers, all helpful information for the asking.

NIAGARA METAL STAMPING CORP., Niagara Falls, N. Y.

Dept. G-424

Bell's Radio Policy

H. B. Thayer States A. T. and T. Broadcasting Patent Plans—Denies Monopoly Intent

New York, N. Y.—H B. Thayer, president of the A. T. and T. Co., has issued a statement relative to the Bell policy with respect to broadcasting policy in which he says:

"Some time before the war the Bell System research laboratories began development of what is now called the vacuum tube, as a long distance wire telephone amplifier or repeater. It was this development that made possible transcontinental telephony.

"The laboratories of the General Electric Co. had also undertaken the development of this apparatus for other purposes.

"As was inevitable, with two great experimental laboratories engaged in similar research, each company acquired inventions and improvements of mutual usefulness.

"With the coming of the war and the paramount requirements of the Army and Navy in the field of communications, each company put aside considerations of patent ownership, and there was rapid co-operative development of this apparatus in its application to transmission by wire and wireless.

"When the end of the war ended the necessity for this emergency disregard of patent rights, a valuable art had been developed which no one in the business of communications could use without infringing upon the rights of others.

"Under such conditions there could be no further manufacturing of certain apparatus, nor further development of this art, and the Navy Department of our government requested this company and the General Electric Co. to try and relieve the situation for the general welfare.

"In response to this request, negotiations were initiated and carried through to an arrangment of cross licenses to which other owners of patents in this field were afterward admitted. For practical operation under this arrangement, it was necessary that the parties to the agreement be given the specific uses of the apparatus in question that were logical to their business.

Company's Fundamental Purpose

"This company's prime purpose in operating under these licenses has been such development of the radio art as would be useful in relation to telephone service.

"Actuated by this prime purpose, we established an experimental broadcasting station in New York in order to be better able to study not only radio transmission problems, but also public taste in broadcast entertainment, and to furnish advice to our Associated Companies with respect thereto.

"By this time there was widespread popular interest in broadcasting, as was evidenced by the growth of the industry furnishing apparatus for radio reception. A realization of the extent of this interest led to a sudden demand for broadcasting stations from individuals and concerns wishing to establish a contact with the public for their own benefit by means of matter transmitted through the ether.

"Consideration of many of these applications disclosed that all of the economic factors involved, as well as the high costs of operation and maintenance, had not been fully realized. It was apparent that if there were a large sale of broadcasting apparatus, some purchasers would experience disappointing results. It was also clear that a multitude of stations would create a condition of congestion that would certainly lessen, and might possibly destroy, the value of broadcasting to the public.

"From the financial standpoint it would have been profitable to manufacture and install all the broadcasting apparatus sought for. We deemed it a better policy, however, to point out all the factors and risks of the situation, and for those wishing to broadcast, to offer our own station at moderate rates, so far as our allotted time limits for broadcasting would permit.

"We are confident that by thus assisting in checking tendencies that were putting the future of broadcasting in jeopardy, we have acted only in the best interests of the public.

Broadcasting Development

"Broadcasting is made possible by inventions that have cost their owners large sums not only in acquiring patents, but also in experimental and development expense. We have recognized the fact that many broadcasters, in making wrongful use of our inventions, have been ignorant of their infringement. We have, therefore, established reasonable license fees, the payment of which, coupled with an agreement to refrain from further infringement, would liquidate any claims for infringement and would give the broadcaster a legal right to the use of the patents during their life. The fees are so moderate as to represent a return far below the customary profits on unpatented electrical apparatus.

Prudence Dictated Patent Suits

"With approximately 400 stations in the United States using our inventions without a license from us, it became a matter of ordinary prudence for us to institute legal proceedings that would

(Concluded on page 25)

Valuation in Rate Making

Chapter XVIII—Use of the Appraisal in Rate Cases

By Charles W. McKay, Associate Editor

It may be well, at this juncture, to consider the practical application of the appraisal in connection with the solution of telephone rate problems. A properly constituted valuation serves two purposes in connection with the rate problem:

First, it serves as the basis of determining the fair value of the property —in other words, the tangible quantity upon which a company may claim that it is entitled to earn a specific rate of return.

Second, the appraisal is a real aid to the solution of the depreciation problem.

The problem of determining an annual accretion to the reserve for depreciation is, at best, no simple one. However, knowing the basic costs of the various items of depreciable property, the average lives and the residual salvage values, it is possible to make a reasonable and accurate computation of the total amount which should be set aside to offset the ravages resultant from depreciation.

Five Factors Involved in Every Rate Problem

Briefly stated, there are five factors which may be considered in connection with the solution of any rate problem. These factors are:

1. The value of the property as determined by appraisement.
2. The revenues accruing from all sources.
3. The operating expenses.
4. The annual depreciation.
5. The rate of return which may be allowed on the property valuation.

Just how these five factors are interrelated in the solution of a specific rate problem, may, perhaps, be clarified with the aid of a simple illustration. We may assume that a certain telephone company serves but one class of subscribers — subscribers to single party service. This assumption is made to simplify the illustration—by limiting the company under consideration to one source of revenue. If the rate for single party service is $4.00 a month or $48.00 a year, and if there are 1,000 subscribers, the gross annual revenue will amount to $48,000. To further simplify the illustration, we may also assume that the operating expenses are limited to the actual cost of running the plant. In other words, there are no items to be considered involving rentals, funded indebtedness, etc. The operating expenses, as we are considering them now, would include the salaries of employees, minor expenditures incurred in connection with the maintenance of the plant and amounts paid out for taxes and insurance. Assume that the total of the operating expenses amounts to $28,000 a year. The operating revenue, then, will be $48,000, less $28,000, or $20,000 a year.

How to Figure Depreciation and Net Revenue

Assume further that the property recently has been appraised and that the reproduction cost of the physical property, including the collateral construction costs, is found to be $150,000. It already has been suggested that an allowance must be made for depreciation. The exact method of computing annual depreciation will be discussed in a subsequent portion of this chapter. For the present, it will suffice to say that, after making due allowance for the average lives of the various property elements, the corresponding salvage values, etc., it is found that the average rate of depreciation is 7 per cent per annum. Seven per cent of $150,000 is $10,500, and this latter figure represents the amount which should be set aside as an accretion to the reserve for depreciation. The figure of $10,500 is to be considered in the light of a further deduction from operating revenue, and the net revenue, therefore, will be $9,500.

Throughout this series of articles, we have taken it for granted that any fair court or commission will allow a telephone company to earn on the total value of its property, including the cost of establishing the business or the going value. This item was not considered in the computation of annual depreciation (as outlined briefly in the last paragraph) for the reason that the cost of establishing the business (or going value) is not depreciable. However in determining the total value of the property for rate purposes, we will be warranted in adding an allowance for going value. We already have assumed that the cost of the physical property, including the collateral costs, amounted to $150,000. Assume that 20 per cent of this amount represents a fair allowance for the cost of establishing the business. The item of going value, then, would be $30,000, and this item added to the total reproduction cost of the physical property, gives a grand total cost of $180,000.

Difference Between Reproduction Cost and Present Value

The question may arise in the reader's mind as to why reproduction cost is used as a measure of rate base value, instead of the corresponding depreciated, or present, value of property. It is a known fact that most courts and commissions consider present value as well as reproduction cost in determining a rate base value. For the purpose of our present illustration, however, we will confine ourselves to a consideration of reproduction costs without going into a discussion of the equity of considering present value as a factor pertinent to the determination of total rate base value. In this connection, however, it may be said that (outside of the public utility field) it is assumed that a company is entitled to earn a fair return upon investment. This assumption carries with it the supposition that any accrued depreciation has been properly cared for through the medium of a reserve for depreciation. The best yard-stick for measuring investment, in most lines of business endeavor, is reproduction cost or—in other words, what it might cost to replace the business in question.

If the net earnings, in the case we now have under discussion, amount to $9,500 and the total reproduction cost amounts to $180,000, the company is earning approximately 5.3 per cent on its investment — as measured through the medium of the production cost. Needless to say, there is something radically wrong with a company that is earning only 5.3 per cent on its investment in property and business. It, therefore, remains to analyze the case carefully and find out just wherein the trouble lies.

It is thought that the foregoing brief discussion will serve to illustrate the correlation between the appraisal problem and the rate problem.

In the May installment of this series of articles, the illustrative case we have assumed will be thoroughly "diagnosed"—to find out why the rate of return is so low. The reader may jump at the conclusion that the service rates are too low, but before deciding definitely that this factor, alone, is responsible for the low rate of return, we must carefully analyze the operating expenses and all of the other items which may affect the net earnings.

Automatic Telephones Ready in Bombay by April

Automatic equipment now being installed by the Bombay Telephone Co. is expected to be in operation during April. The company has approximately 8,000 exchange and private lines working in Bombay, Karachi, and Ahmedabad.

Minneapolis, Minn. — The Northwestern Bell, Tri-State and the long lines dept. of the A. T. and T. Co. will spend more than $3,000,000 in service extensions in 1924.

Vicksburg, Miss.—In Mississippi, the Bell will spend $904,000 for additions and extensions in 1924.

Jacksonville, Fla.—During 1924 the Bell company will spend $1,200,000 for service extension.

Archbold, Ohio.—Extensive improvements are scheduled for the system of the Archbold Telephone Co. which recently increased its capitalization from $25,000 to $50,000.

Antwerp, Belgium — The Belgian Postal and Telegraph Administration intends to try out an automatic telephone system in the near future.

During the year 1921, the number of telephone conversations in the United States totalled 17,520,000,000 or an average of 48,000,000 a day.

Minneapolis has in proportion to population, nearly 5 times as many telephones as London, over 7 times as many as Liverpool and over 29 times as many as Naples.

The Western Electric manufactures 110,000 separate and distinct parts which is equal to the total number of parts made by 22 of the largest automobile manufacturers in this country.

New York, N. Y.—Approximately $66,000,000 will be spent for additions to the New York Telephone Co. system during 1924.

Empire Oil Wire System Shows Far-Reaching Private Lines

Bartlesville, Okla.—An idea of the extent of the private wire systems operated by the major oil companies of the southwest may be obtained from the accompanying map of the Empire

companies telephone and telegraph plant. The system stretches from Gainesville, Texas, on the south to Kansas City at the north, and taps every important Mid-continent oil field. More than a million telephone messages and almost a half a million telegrams were handled over the Empire's wires during 1923.

Telephone Plant Conference at Purdue, April 22-23

A conference of telephone plant men, engineers and managers will be held at Purdue University, Lafayette, Ind., Tuesday and Wednesday, April 22 and 23. On the program will be papers by A. L. Staderman, of Terre Haute, Ind., on "Standardization in the Telephone Industry," by Dr. F. O. Anderegg, of Purdue University on "Corrosion of Lead Cable Sheath," also papers on "Inductive Interference," "Maintenance of Telephone Switchboards," and "Economical Cable Distribution." On the evening of Tuesday, April 22, a dinner meeting will be held at which the principal speaker will be J. N. Kirk, outside plant engineer of the Department of Operation and Engineering of the American Telephone & Telegraph Co.

(Continued from page 23)

establish our ownership of patents and our rights as owners. Not to protect them would be sheer neglect of duty.

"For an initial suit we decided to select a nearby station so as to minimize the costs to both parties concerned. Pursuant to this plan, we respectfully called to the attention of the owners of a station in New York, the nature and extent of their infringement, listing many of the patents involved. Our notification was ignored and suit was brought.

"A suit was also brought against another defendant in relation to methods of sending programs of entertainment along wires, which methods we believe infringe upon our patents and which might interfere with operation of neighboring telephone service. Obviously, this suit is also a matter of plain business prudence.

Bell Policy

"We have been asked what our future policy will be in connection with radio broadcasting. The art of radio broadcasting is new and changing. Speculation as to the future is difficult and futile. The new problems which are constantly presenting themselves are being given the closest study, but the details of our plans could only develop as the art develops. The general guiding principles are not likely to change. They are: that we keep in and abreast of the development of the art and that we encourage in every way possible such development by others. We shall make it possible, so far as lies with us, for any one to secure broadcasting apparatus at moderate prices; and for those broadcasters who are now infringing our patents, to continue their use under reasonable and moderate terms. For the present we shall continue to operate our own experimental broadcasting station, making its facilities available under reasonable rules, in the public interest, for those who wish to test broadcasting as a medium for attracting the public's notice. Far from desiring the sole responsibility for broadcasting, it is our strong belief that, in the public's interest and in our own interest, nothing should be allowed to interfere with any development of it that may be proved to be beneficial. We heartily favor government control of such activities and the federal legislation that is pending has our cordial support.

"A monopoly, either of broadcasting for entertainment of the public or for hire, is not desirable from any point of view. There has been no danger and is no danger of such a monopoly."

Mattoon, Ill.—For $250,000 Mattoon Telephone Co. has purchased Christian County Telephone Co.

Keep Your Lines in Service

Importance of the Time Factor in Toll Line Maintenance

Telephone lines, naturally, are constructed for the purpose of earning a fair return on the investment. This being the case the thing next in importance to the building of the lines is the keeping of them in service.

All open construction is subject to the forces of nature, such as storms and deterioration, and they, in addition to accidents, may be the cause of totally or partially disabling telephone service. This must be restored as promptly as possible, otherwise the revenue will suffer. Revenue losses will be more noticeable on toll circuits which have an earning power of from $30 to $100 per hour and in groups comprising Phantoms and Morse, which greatly increase the value of a single circuit in the group.

Before trouble on toll lines can be cleared, it must be located. This may be done either by instruments situated at the central office or by a portable device in the hands of the troubleman. Finding trouble without the aid of some testing device is a hit or miss proposition and is likely to entail a gross waste of time. All up-to-date telephone companies desire to employ devices of economical value, as the saving effected in dollars and cents and the good will of the public repays many times a year the cost of such a device. It is even possible that a testing device which will locate trouble and effect a saving of thirty minutes of time by restoring service at peak periods can repay for itself on one trip. Not only is the saving of time for the troubleman to be considered, but the revenue earning power of a circuit at its peak period is a very important issue. It, therefore, behooves the telephone manager to employ any practical means to get important toll circuits back into service as soon as possible, in order to save what might otherwise be lost revenue.

Difficulties Encountered Under the Old Method

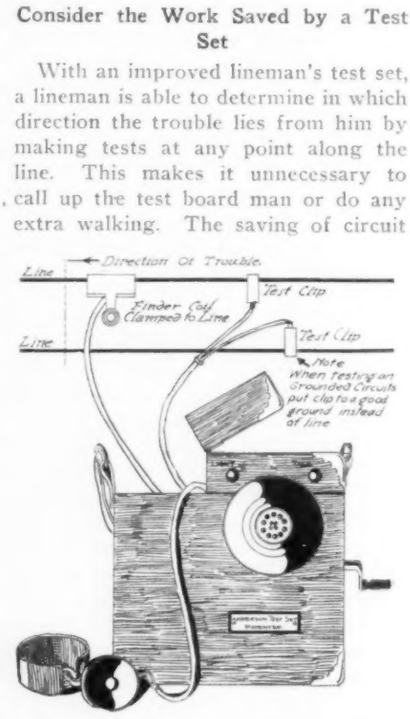
The usual method used in clearing trouble on toll lines is for the lineman to get an approximate location of the trouble from the test board man and then cover the line in the vicinity of the location. This he can do in reasonably good time, when the lines are built along highways, but where, as frequently is the case, the line follows a private or railway right-of-way, there is a great deal of time lost, as he must proceed on foot. Covering lines afoot in mountainous and swampy sections is a very slow process of clearing trouble, and in bad weather it often works a hardship on the lineman, particularly in the winter time. In following out the usual practice of clearing trouble, a lineman is asked to "call in" when he has reached the approximate location of the trouble. This is done either to get an O. K. on his work or to ask for further instructions in case he failed to find the trouble at the location

Anderson test set open

given by the test board man. Every time he "calls in," he ties up one circuit for talking, and, generally, another for testing, besides taking up the time of operators, troublemen and test board men.

Consider the Work Saved by a Test Set

With an improved lineman's test set, a lineman is able to determine in which direction the trouble lies from him by making tests at any point along the line. This makes it unnecessary to call up the test board man or do any extra walking. The saving of circuit



Method of locating short on metallic line

time is a very important factor and it usually is the case that if one or two circuits of a group are in trouble, the balance of the circuits in the lead are overloaded, trying to take care of the business that ordinarily is distributed among all circuits. This being true, the tying up of the good circuits for thirty or forty minutes for testing purposes, in addition to any extra loss of time that might be encountered, proves to be something well worth avoiding when revenue is taken into account. Another feature which has been the means of saving toll revenue during the busy season of the toll lines, is that a lineman can clear his trouble at night and avoid carrying it over to the following day. He is guided entirely by his ear in getting the exact location, after which he can throw a beam of light from the headlight of his car in the direction of the trouble and complete the repairs.

This improved lineman test set also is proving to be a great time saver to linemen in locating trouble on rural lines. Even in many forms of instrument trouble, a lineman with the finder coil can trace to the very piece of apparatus in a telephone that causes the trouble.

Some of the Uses for This Instrument

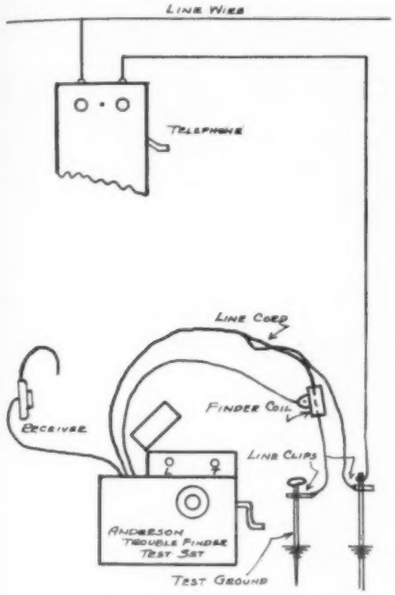
In making tests the lineman is guided by a generator tone in his test set that is induced on the line when he turns the generator crank. This set is comparable to cutting the receiver in series with the generator, but the inductive principle employed in the finder coil makes it unnecessary to cut the lines. This feature is especially valuable in cases where several spurs branch off from a main line, as the spur with the trouble on it can be promptly selected, thus frequently avoiding the loss of valuable time.

Cut No. 1 shows the test set open, exposing the essential working parts. The Finder Coil is used for a purpose similar to that of an exploring coil on a cableman outfit. Cut No. 2 shows the method employed in locating a short or cross on metallic lines.

A "ground" on a metallic circuit, or trouble on grounded lines, is located the same way as in a case of a short on a metallic circuit, except that one of the line clips is attached to a ground connection and the other to the line in trouble. Opens are located with a lamp in the test set which lights only on a closed circuit. There are many useful features to the test set, such as locating poor ground rods, trouble in house wiring, open joints, etc. A user of the improved test set soon acquires a knack of judging distance by the volume of tone derived by the use of the finder coil. This cuts down the number of tests and will effect a saving of additional time.

Sketch No. 3 shows the method used

in locating trouble in ground rods. This is an especially effective test as it



A.C. METHOD OF LOCATING POOR GROUND WITH AN ANDERSON TROUBLE FINDER TEST SET

Method of locating ground rod trouble

is a means of locating poor ground rods with alternating current or the same kind of current as is used in actual service.

Wisconsin Bell Takes Over Two More Plants

The Wisconsin Telephone Co. has bought the Pierce County Telephone Co., with headquarters at River Falls, Wis. The Wisconsin company also has taken over the Citizens Telephone Co. at Sheboygan, Wis.

Aquilla (Tex.) Telephone Plant in New Hands

Mr. and Mrs. F. N. Newton of Shiro, Tex., have purchased the Aquilla (Tex.) Telephone Exchange and Aquilla's Delco Light plant from Mr. and Mrs. G. H. Hunt.

Henry P. Folwell, for the past four years district traffic manager for the Cumberland Telephone and Telegraph Co. in Memphis, Tenn., has been promoted to the position of district traffic manager for the Southern Bell and Telegraph Co. at Atlanta, Ga.

After having served as president and treasurer of the Home Telephone Co.'s Bluffs and Meredosia exchanges for a number of years, G. W. Van Gundy has retired from the telephone business and has sold his interest in same to Messrs. Domke and Tucker of Jacksonville, Ill.

"Safety First" Method of Unloading Poles

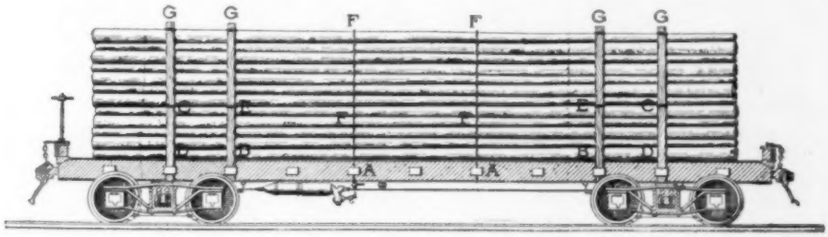
The telephone and telegraph division of H. L. Doherty's Empire Oil & Gas companies practice "safety first" in field work as well as in the various offices. The accompanying figure and description explain some of the measures taken:

Never allow anyone on top of load under any circumstances.

Never cut top wires, G.

For safety attach cables or ropes to pockets A, throwing the cables or ropes over the car as per F of the illustration. The cables or ropes are then securely fastened to pockets on opposite side of the load in such a manner as to make it possible for them to be gradually released by snubbing. The following operations should then be carefully performed and followed in exact rotation.

1. Cut the two inside stakes at B.
2. Cut the wires at E.
3. Cut the outside stakes at D so that



they are free at the pockets but both wires C are still intact.

4. Cut center wires C. The stakes having been previously cut, will swing out from the load, but the cables or ropes F will still hold the poles in position and make it impossible for the load to fall.

5. Release the snubs gradually until the poles reach the ground.

California Men Meet at Fresno —Discuss Construction

Fresno, Cal.—The first meeting of the California Independent Telephone Association to be held in the San Joaquin Valley was devoted principally to a discussion of construction plans. Ravages of white ants, which are eating holes in the southern section of the state, and the plans made by one of the member companies to lay cables in earth without protection, except an asphalt protection for the larger sizes, were among the features talked over.

A discussion of joint pole arrangements and rules governing relations between the telephone companies and the public also occupied the attention of the meeting.

George Watts Heads East Central Indiana Association

Noblesville, Ind.—George Watts of Knightstown was elected president of the east Central Indiana Telephone Association at its spring meeting held here. The association elected Earl Talbot of Shelbyville, vice president, and H. B. Walls of Noblesville, secretary.

E. L. Carter of the Indiana Public Service Commission spoke of the relations between utilities and their patrons. A. H. Hinkle of the State Highway Commission reminded the association that a new ruling requires telephone poles along state roads to be located 47½ feet from the center of the road, in his remarks. W. K. Kendrick of the Indiana Bell spoke on long distance service. An operators' conference was conducted by J. L. Wayne of the Indiana Bell.

Earthquake Eliminates Old Japanese Telephones—Introduces Automatic System

Since the destruction of the old style telephone equipment, in the earthquake, the Tokyo Telegraph Bureau is considering the installation of automatic telephones. This will greatly facilitate the use of telephones by foreigners. The losses in the earthquake were estimated at 150,000,000 yen and replacements will probably not be complete before 1925. Work is under way on replacement of six former central stations with the expectation that they will be ready by the time telephone equipment arrives in September. A wireless telephone service between Tokyo Station and Kodzu has been under test with satisfactory results. The Railway Department also is considering the installation of wireless plants in other directions, to avoid a break in communications such as was caused by the most recent earthquake in January.

Bell Wants to Buy Indianola (Fla.) System

Washington, D. C.—The Southern Bell Telephone Co. has applied to the interstate commerce commission to purchase all properties of the Brevard County Telephone Company, Indianola, Fla., for $110,000.

LINE CONSTRUCTION (LL-18-30)

GROUNDING

GROUNDING AERIAL SHEATH. Whether the sheath of the aerial cable and messenger strand are to be grounded depends largely on the possibility of stray currents from trolley returns in the vicinity which might set up electrolytic action and corrosion in the ground wire. Usually it is advisable to have the messenger and sheath insulated from the ground when there is any chance of meeting with trouble from this source.

The use of two or more grounds to a single sheath and messenger greatly increases the danger of electrolytic corrosion, particularly if the two grounds are widely separated, for then a bad joint or poor bonding in the track will cause the current to enter the cable at one ground and leave at the other, providing that the fault is located between the two grounds. Should there be a poor track bond or other source of high resistance in the path of the return line, then this will cause a difference of potential which will cause a definite flow of current in the sheath running parallel to the track. For this reason, it is safest to ground the sheath at one point only, and at a point near the center of the run.

The use of a ground in addition to an uninsulated connection between the aerial and underground systems is in effect a double ground, and for this reason the sheath of the aerial system should be well insulated from the underground sheath. This can be accomplished by the use of an insulating sheath or by means of running the cable through a junction box.

When metal rings are used on a grounded aerial system, the contact of the rings with the sheath is an uncertain proposition, hence it is advisable to thoroughly bond the sheath and messenger together. If not bonded in this way, then the current passing through the ring and sheath contact is very likely to cause burns in the sheath at the point where it rests on the rings. Preferably the bond between the sheath and messenger should be made at the point where the ground is connected.

In an insulated system, the cable sheath is insulated from the sheath of the underground system as already described, and the messenger strand is then insulated from the guy strands or insulators are placed in the guy strands themselves as called for in the National code. There is no necessity of bonding the messenger and sheath.

GROUNDING CABLE TERMINALS. Protected cable terminals of the all metal type may be grounded or not depending upon the cable conditions, and upon the arrangement of the protector ground strip within the terminal. With that type of terminal having a complete metallic connection between the protector ground strip and the cable entrance nozzle, a separate ground must be provided for the protector strip when the cable is not grounded, or the purpose of the protectors will be defeated. This ground, however, in this type of terminal, will ground the cable and thus will allow stray currents to enter the system, particularly if the protectors at either end of the line are both grounded. In installations of this sort, care must be taken so that the terminal and cable together are grounded only at one point.

With terminals of the metal type where the protector ground strip is insulated from the frame, it is better to provide a separate ground for the protector strip than to electrically connect the ground strip and frame to a common ground. Such connection gives more positive protection than with a ground to the sheath.

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UNDERGROUND CONSTRUCTION (LL-21-40)

CONDUIT, MANHOLES, DETAILS

CONDUIT CONSTRUCTION. The actual construction of the subway system depends principally upon street conditions, and upon the amount of space already taken up by the lines of the various public utilities. In the smaller cities and towns where the streets are seldom disturbed by excavation the conduit system can be much simpler and less expensive than in large cities where the streets are congested and where frequent alterations are made to the gas, water and electric light systems.

Where there is much excavation in prospect, the conduit systems must be much stronger mechanically than where the streets are seldom touched, and expensive and effective protection must be provided against the possibility of damage by picks and shovels. Again, the subway of a large city must have considerable resistance to bending moments that might be caused by shoring up the conduits while an excavation is being carried on beneath them.

From the standpoint of mechanical beam strength and protection against tools, the telephone subway systems can be divided into two general classes: (1) The complete Reinforced Concrete Envelope, and (2) The Partial Concrete Envelope. The "envelope" of course refers to the concrete distributed around the tile ducts.

With the complete concrete envelope type, the multiple duct tile is completely surrounded by a wall of concrete approximately three inches thick. This concrete tube forms a beam of considerable strength and at the same time affords protection to the tile against injury by picks and shovels in the hands of excavators. To further increase the beam strength against bending so that the subway can be spanned over considerable distances, it is common practice to reinforce the concrete shell by means of iron rods placed in the top and bottom layers of the concrete which are laid parallel to the run of the conduit. Conduits of this sort are an insurance against interruptions to service during street repairs, etc., but of course are relatively expensive.

The "partial concrete envelope type" is well adapted to the smaller cities. In this system, the multiple tile duct carries the cables as before, but instead of being surrounded on all four sides by a concrete shell, the duct tile is simply laid on a flat concrete slab. This slab acts as a footing course for the tile and will average from four to five inches in thickness and projects about three inches on either side of the duct. The slab offers very little resistance to bending and therefore will afford little protection against excavations made at a lower level than that of the slab.

As a further protection to the top duct against excavating tools, an additional slab of concrete may be placed on top of the duct. This need only be three inches thick as it contributes nothing in the resistance to bending. While this top slab adds to the cost of construction, it is well worth the investment as it eliminates the danger of broken tile and interruptions to service. Like the bottom slab, it should project well out beyond the sides of the duct.

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Each Serves Its Community

In Fraser, Colorado, a log cabin of three rooms shelters a telephone exchange that connects with the mountain homes of cowmen, miners, homesteaders and tie-cutters. In the heart of New York City a new building of twenty-nine stories is to become the home of several metropolitan central offices serving some 120,000 telephones. This building will contain, as well, offices for executives and for engineering, commercial, plant and accounting forces, providing space for over 7000 telephone workers.

Each of these buildings helps to render adequate and economical telephone service in its own community. They stand at the extremes in size, equipment and personnel. Yet they both indicate the nation-wide need for adequate housing of the activities of the Bell System; and they illustrate the varied ways in which that need is being met. One of the largest single items of plant investment of the Bell System is real estate, comprising nearly 1700 buildings acquired, with their sites, at a cost of $180,000,000.

It is continuously the aim of the Bell System to construct and so to situate each new building—whether executive office, central office, storehouse or garage—so that it shall serve its community with the utmost efficiency and economy, and remain a sound investment throughout its period of life.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES
BELL SYSTEM
One Policy, One System, Universal Service

Practical Plant Problems

Chapter XVII—Reconstruction Plans (Continued)

By Charles W. McKay, Associate Editor

In the last article of this series, the writer dwelt in some detail upon what seems to him a most important subject—the subject of "Spring Reconstruction Programs." As suggested in the March article, many of us are prone to make elaborate plans for plant rehabilitation—plans inspired by the "trouble" resultant from hard winter storms—only to abandon, or postpone, these plans as the weather conditions become more settled during the late spring and winter months. The writer is going to outline, briefly, a specific plan of procedure which was adopted by a manager of a moderate-sized telephone property with most gratifying results.

During an especially hard winter many "weak spots" developed in his outside plant. The manager vowed that "if he lived through the winter," he immediately would adopt constructive measures for a general plant survey and follow this survey with an intensive reconstruction program.

The plan for the survey was an exceedingly simple and economical one and was so formulated as to enable its prosecution by plant employees, without seriously interfering with their regular work. It so happened that the company's territory embraced several central office districts, each in charge of a "combination" man whose duties included the clearing of central office and subscribers' station "trouble" and the maintenance of outside plant.

The manager called all of these men into his office for a preliminary conference and outlined the general scope of his plan.

This plan, in brief, provided for the division of each central office district into a number of definitely defined sub-districts. The man in charge of each central office was instructed to devote at least one hour each day to a careful, detailed inspection of the plant lying within some one sub-district. In order to minimize interference with the maintenance man's routine duties, the manager suggested that he (the maintenance man) so plan his inspection work that the daily survey would be made in a sub-district where he was called to do routine work.

Inspector-Trouble Man Should Make Copious Notes

To illustrate: If in starting the daily routine it was found that a case of trouble had to be cleared in a certain sub-district (or perhaps an installation made in this district) after the routine work had been completed, the maintenance man would take up the survey work in the district involved.

The "survey" included a detailed inspection of the pole, wire and aerial cable plant. Each pole was subjected to a bar test to ascertain its condition below the ground line. Poles to be replaced were marked with a certain symbol, and poles to be reset were marked with another symbol. The maintenance man also kept a written "log" of conditions as found.

The wire plant was subjected to an equally careful scrutiny, poles being climbed at frequent intervals to determine the condition of the wire, as to corrosion; the condition of the insulators and the condition of the tie-wires.

In connection with the inspection of the wire plant, the general condition of the drop wires leading from the pole lines to the subscribers' premises also was carefully noted. A running "log" was made, denoting defective line wire which should be replaced; defective drop wire to be replaced and aerial wire and drops which required only a general reconditioning, such as the removal of slack, the overhauling of house or pole attachments and the replacement of defective tie-wires.

In many instances, it was found that the reconstruction work, in connection with the wire plant, could be done at the time of the inspection, such, for instance, as the reconditioning of house or pole attachments, the removal of slack and the replacement of defective tie-wires.

Check Cross Arms, Anchors and Wire Leads Carefully

In connection with the inspection of the pole and wire plant, especial attention should be given to the condition of the cross-arms. Cross-arms that are badly "checked" or rotted should be marked for replacement, in the inspector's "log." Many potential cases of trouble have been forestalled by the timely replacement of questionable cross-arms.

Another point to be borne in mind, in connection with the survey of the pole and wire plant, is the advisability of replacing heavy open wire leads with aerial cable. In connection with this phase of the problem, it is well to consult records (or in the absence of such records, to consult the trouble man's or wire chief's memory) to ascertain just what leads have been the most frequent source of trouble during the past winter's storms.

Again, the condition of anchors and guys should be determined as accurately as possible. In many cases, it may be advisable to replace anchors of the antiquated log type with so-called "patent" anchors. It also may be necessary to provide additional reinforcement to certain of the pole lines by the placement of new anchors, or guys, at strategic points.

The foregoing will serve as outline of a practical plan of procedure. Specific details, as to the carrying out of this plan, will follow in May.

Farmers' Mutual Telephone Co. of Lake Sinai has been incorporated at Sinai, S. D., with a capital of $20,000. Incorporators: L. E. Johnson, C. L. Myhre, Hans Erekson.

Festus Telephone Co., Festus, Mo., will do considerable construction work this spring, consisting of about one mile of lead cable, a new main frame, etc.

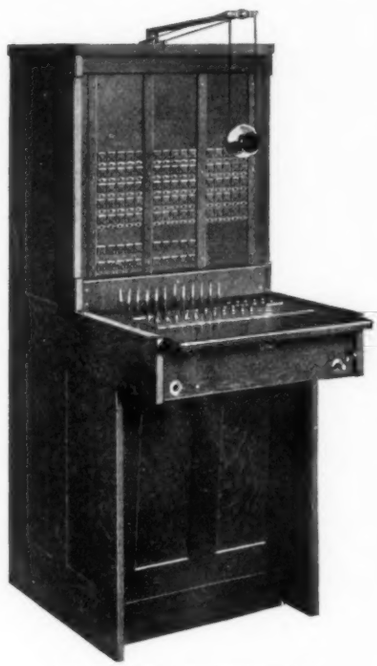
Advance Telephone Co., Advance, Mo., will lay about one mile of cable underground at Marble Hill and will make additions to its main frame, etc. It also will install cable at Advance.

Commercial Telephone Co., Washington, Mo., will erect about a mile of lead cable and will make other improvements this spring at Washington.

Eldon Telephone Co., Eldon, Mo., will complete the construction work begun last year.

Big Bend Telephone Co., Talcott, W. Va., has been organized by W. A. Hedrick, M. H. Wyant, B. H. Allen, C. S. Wyant, W. R. Boyd, et al.

The very latest in Magneto Switchboard construction is obtained only in the new Leich Double Lamp Supervision Switchboard



1-B-150 LINE SWITCHBOARD

Consider the Following Features:

1st. Double lamp supervision on all cord pairs, giving permanent clearout signal until drops are restored.

2nd. Double lamp recall signals, using same lamps. Can be flashed by hand generator or Automaphone.

3rd. Alternating current from lighting circuit used to operate lamps. No batteries or charging equipment required. An exclusive Leich feature.

4th. Lamp signals controlled by electrically restored clearout drops. No relays or complicated devices used. Simplicity in itself.

PATENTS PENDING

Other equipment same as furnished on our standard 1-B-150 switchboard including the unexcelled Leich 1-A drop with fixed pole piece and permanent armature adjustment.

For quick delivery we stock these boards wired as follows:

Code No.	Lines	Cords	Repeating Coils
1-B-150	50	15	5
1-B-150-B	100	15	5
1-B-150-C	150	15	5

EQUIPPED AS SPECIFIED

Write for prices and detailed specifications

LEICH ELECTRIC CO.

Telephones, Switchboards, Accessories

GENOA, ILLINOIS

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TELEPHONE & ELECTRIC SUPPLY CO.
Spokane, Wash.
B-R ELECTRIC COMPANY
Kansas City, Mo.

LINE AND DESK

PROTECTORS THAT DO NOT PROTECT

During an electric storm, lightning may cause and generate currents of high pressure and frequency in telephone lines. Hence, it is of the utmost importance to keep out of the exchange those damaging currents which might burn up the windings of various electromagnetic devices used for switching or signaling purposes. Protection is essential at the points of entrance to the central office or to the subscriber's premises.

Types of Protectors—There are various types of air gap arresters used. Vacuum arresters are not used extensively in this country. By far the most popularly used arrester is the so-called "carbon-air gap arrester." Any telephone man working about an exchange is familiar with this arrester, which consists of two carbon blocks and one mica sheet separator. A metal globule of some very soluble metal is embedded in one of the blocks. Both metal and carbon surfaces are flush.

Operation—In operation, the two carbon blocks are held separated from each other by the mica sheet. The latter is cut in a U-shaped design to allow a gap between the carbon-metal globule surface on one side and the other carbon surface. Thus, an air gap between carbon faces is formed. Any lightning discharge causes a sudden electrical impulse of high frequency which will jump across the gap formed by the blocks and find a low resistance path to earth. If an arc is formed by this current the metal globule will melt and afford a direct protective path to ground.

Carbon-air gap arresters will not protect and are useless if the proper precautions are not taken in installing and maintaining them.

Various Don'ts:

1. Do not slide mica sheet between carbons.
2. Do not reduce roughness of carbon surfaces by rubbing against each other.
3. Do not use oils or polishes to clean surfaces.
4. Do not insert mica sheet upside down.
5. Do not cover the whole or part of metal globule with mica sheet.

A Few Do's:

1. Keep notched edge of mica sheet flush with lower edges of carbons.
2. Keep notched edge of mica always downward.
3. Remove dust from carbon surfaces before assembling.
4. Use clean cheese cloth for cleaning surfaces of carbons.
5. Install all carbons straight and uniform.
6. Replace defective carbons promptly.

Room for Thought—The writer believes that a one-piece, carbon-air gap arrester could be developed to remove the above defects and yet retain the desired good features of present arresters.—Contributed by R. Senay.

SOME QUESTIONS RELATIVE TO TRANSMISSION.

A subscriber, whom we have been able to help on previous occasions, writes us again as follows:

"We are serving a town five miles away from our C— exchange with 24-volt, common battery service. The pole line now contains four 10-pin arms all of which are filled, and we will require at least eight more circuits to take care of additional subscribers. This would require two additional cross-arms, which would make the line too heavy. I have thought of running No. 19 B&S ga., .08 or .10 capacity, cable to take care of the subscribers' lines. This would require about five and one-half miles of cable, but I have been advised that we would have trouble in transmission on account of the 24-volt common battery service, especially when one subscriber in M— would talk with another subscriber in the same town. In this case, it would mean a loop of about ten or eleven circuit miles. I would like to continue the 24-volt common battery service to this town, if there is a practicable way of doing it."

The resistance of a subscriber's loop through the No. 19 ga. cable, assuming a length of five and one-half miles, would be 484 ohms. To this would be added the resistance of the subscriber set—say, 40 ohms—and the resistance of the central office circuit, which would lie between 60 and 240 ohms. The total resistance of the loop would then be somewhere between 584 and 764 ohms. With a 24-volt battery, the current through the transmitter would be somewhere between .031 and .041 amperes. The reduction in current through the transmitter produces a loss in transmission equivalent to 8.1 to 10.2 miles of standard cable. Assuming one-half mile of standard cable as the equivalent of the central office, the transmission between two subscribers in the outlying town would be shown by the following table:

	Mi. Stand. Cable.
Loss in Transmitting Loop (5½ miles of No. 19 ga. .07 mutual cap. cable)	6.16
Current supply loss	8.1 to 10.20
Central office	.50
Receiving loop (5½ miles of No. 19 ga. .07 mutual cap. cable)	6.16
	20.92 to 23.02

This assumes a substation set of the common battery booster type with a transmission efficiency equal to that of the set specified for the standard cable reference circuit. It will be seen that the transmission is somewhat better than the commercial limit, which is usually placed at about thirty miles of standard cable. There may be some difficulty in the operation of relays, with the small current value obtained.

While the transmission would be commercial on local connections, the loss of from 14.2 to 16.3 miles in the transmitting loop would be excessive if only 24-volt battery is provided on toll connections. If 48-volt battery and the usual toll cord circuit is provided, the current through the set would be about .082 amperes and the current supply loss would be about 4.4 miles of standard cable. This would make the total loss in the transmitting loop on a toll call about 10.5 miles of standard cable. The long distance company would be able to tell if this is excessive.

In case only 24-volt battery is available, or if the long distance company finds 10.5 miles of standard cable is too great an equivalent on toll calls, the only alternative is to use local-battery-talking, central-battery-signaling sets for the stations in the outlying town.—Staff Contribution.

SHOULD THE WIPED JOINT BE COVERED WITH TALLOW?

One of the rights and privileges of the Englishman seems to be that of writing to the papers when he has anything to say. This applies to the technical papers as well as papers of general circulation. Recently, a letter addressed to the "Electrical Review," of London, created quite a controversy over a practice in wiping joints that seems to be prevalent in England. The particular query that started the discussion was the following: "On completing a wiped joint, a plumber goes through the ceremonial of anointing the joint with tallow. Would someone please tell us, pro bono publico, what is the object of this ritual?"

Among the answers that began to roll into the paper may be found the following: It removes finger marks and makes a better looking job. It gives a "mat grey" finish and makes defects and pinholes plainly visible. It is done because "old Joe," with whom the splicer worked, "did it." It cools the joint after wiping. It insures a sound plumb. It brings the tin to the surface, preventing porous metal. It is a survival of the practice of "overcasting" the wipe.

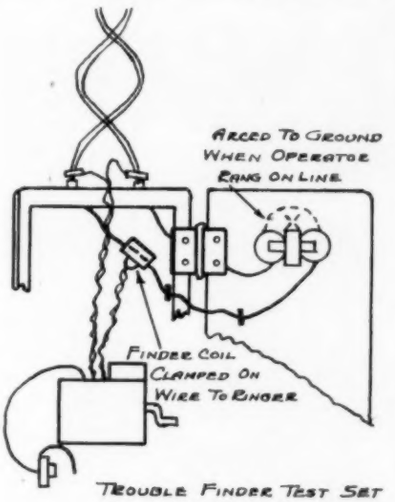
As we recall the work of a number of cable splicers of our own acquaintance, we do not remember that any of them make a practice of wiping over the joint with tallow, although we have seen some who followed the practice of spitting on the wipe. The American cable splicer has a notable record for making joints that do not crack and which are absolutely water proof. It would seem from his practice that the tallow wipe does not add much to the security of the joint, although it may improve the appearance somewhat, when the blow torch is not used to finish the joint.

HELP! HELP! WHO HAS SOLVED THIS PROBLEM?

One of our friends writes us and wants to know if a 100-ampere generator and a 50-ampere mercury-arc rectifier can be operated in parallel to charge a battery rated at 125 amperes, charging rate. We were just prepared to write an answer to his query, saying that we believed it would be very difficult to operate, in parallel, two devices with as different characteristics as a shunt-charging generator and a mercury-arc rectifier. Just as we were preparing to do this came a hazy remembrance that some one had told us that he had done so successfully. This left us much in doubt as to whether it could be done or not; and, so, the only thing we can do is to call for help. Perhaps some of our readers has had this same problem and can give us the benefit of their experiences.

ILLUSTRATING HELP AFFORDED BY TEST SET.

Accompanying sketch shows how I found a high resistance short in ringer coils by use of the Anderson test set. Bells were only shorted while ringing was in process or current flowing. This trouble would not show in either



Trouble Finder Test Set Attached To Telephone Showing Trouble In Ringer

bridge or volt meter, as there was not enough current flowing in either to seal short. In my opinion there isn't anything on the market to beat the Anderson test set as a trouble finder.—Contributed by Bert Bradley, Chase, Kan.

P. C. Cunningham, of Lincoln, Neb., succeeds E. L. Boydston as manager of the Sidney (Nebr.) exchange. Mr. Boydston has been transferred as manager at Ogallala. T. R. Adams, temporary manager at Sidney, has returned to Grand Island.

Cushing (Okla.) Telephone System nears completion; cost, $22,000.

Frank Bohn, general manager, announces letting of contract for a new building and equipment for Ft. Wayne (Ind.) Home Telephone Co., to cost over a million. This is the start of a $2,500,000 expansion program.

Carnegie (Okla.) Telephone Co., J. A. Wright, manager, will build a new office building.

Control of the Multnomah & Clackamas Mutual Telephone Co. has passed from the hands of J. G. Schultz to K. A. Miller, cashier of the Bank of Gresham and mayor of Gresham, Ore. Mr. Miller formerly was secretary of the company.

Red Devil Tools Better Made

"I've had your pliers for ten years"

—"they should be everlasting! They puzzle everybody how they were made. I value them so highly that I keep them in my tool kit, away from the shop." —from an electrician's letter in our files.

"Red Devil" Pliers have been giving a good account of themselves for over a quarter century. Drop forged from tool steel for strength. Made in one hundred styles—one for every need.

"Red Devil" Diagonal Cutting Plier

Will cut through silk insulated wire without raveling the insulation. The cutting edges cut and stay sharp. Style 942. Sizes 4, 5 and 6 inches.

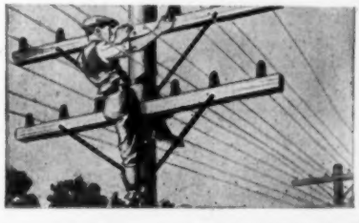
"Red Devil" Insulated Side Cutting Plier

meets the most exacting requirements of electrical workers, for high tension work and all-around handiness and safety in a plier. Tested to stand 10,000 volts. No. 4950. Sizes 6, 7, 8 inches.

"Red Devil" Pliers are on sale at all dealers, or if not in stock, your dealer can get them for you.

Send for electricians' tool booklet—free.

SMITH & HEMENWAY CO., Inc.
Mfrs. of "Red Devil" Tools
Dept. TE
261 Broadway, New York, N. Y.



Distributing the Load

Michigan Bell Company Adopts Rotation Billing to Avoid Burdensome Peaks

Beginning April 1st, according to "The Mouthpiece," the Michigan Bell Telephone Co. adopted a new system of billing subscribers, which is known as "rotation billing." This system has been in use for some years in different businesses, such as gas companies, power and light companies and water supply utilities. In a few words, the plan is simply the dividing of the work and rendering bills or statements into parts which are completed at different dates, each month, thus leveling out the load which is particularly heavy when the entire job must be completed at one time.

As applied to the Michigan company, it means that the monthly bills will be issued in six equal groups, dated the 1st, 6th, 11th, 16th, 21st and 26th, and will be mailed as soon as ready after those dates. Outside of Detroit all subscribers in an exchange will have the same billing date each month. In Detroit there will be different dates for different central offices, although all subscribers of any one central office will have the same billing date.

The fact that many benefits are derived from spreading the work of issuing bills over a greater length of time is quite apparent. Lightening the heavy "peak" load, now experienced in the accounting department at the first of each month, brings a number of advantages to that department, chief of which is the opportunity to specialize still further in the various operations of accounting work, resulting in increased efficiency and likewise in reduced costs. All subscribers will benefit from the fact that under rotation billing, bills will carry all charges and credits up to the date they bear and will reach them very shortly after that date, so enabling easier understanding and checking of the bills.

Heretofore, charges for toll messages have been billed up to the 20th of the preceding month, and in Detroit charges for additional local messages have been billed for the second preceding month. Under "rotation billing," these charges will be for the month ending at the date of the bill. As the accounts will be more nearly up to date, they will be clearer to subscribers, and the commercial offices will benefit, because fewer explanations will be requested. In the Detroit commercial office, some congestion has occurred. Under the new plan, all subscribers will not receive bills each month at the same time, the payments and inquiries will be spread out over the month and the reduced number of subscribers requiring attention at one time will not have the inconvenience always accompanying any attempts to serve a large number in a short space of time. The work of the commercial office will correspondingly be carried on with greater facility.

The successful manner in which "rotation billing" has met many difficulties of other public utility companies forecasts the success of this effort.

Stockwell Made Keystone Manager—No Change in Control

F. Clark Durant, Jr., and Joseph F. Stockwell have been elected vice-presidents and directors of the Keystone Telephone Co., Philadelphia, succeeding James Collins Jones and Edward M. Cooke, resigned. Mr. Stockwell also was made general manager, vice Mr. Cook, who engages in other business. Mr. Stockwell has been associated with the company for twenty years. George B. Macomber, of the banking firm of Love, Macomber & Co., New York, and Marcus Beebe, Jr., were elected directors. The changes are not the result of new interests in the company, the Nathan T. Folwell and Percival E. Foerderer interests still owning a majority of the stock. The new banker directors aided in the floating of the recent issue of preference stock.

Joseph F. Stockwell, G. M. Keystone Telephone Co., Philadelphia

Based on the larger volume of business in January and February this year, indications are that 1924 should show a greater increase in installations of automatic service than did 1923.

Radio Broadcasting Is "Up in the Air"

The American Telephone and Telegraph Co. has filed suit against Marcus Loew and George Schubel, operators of a radio station known as WHN, located on Loew's Theatre in New York City. It is alleged that WHN is infringing certain patents affecting radio broadcasting which are controlled by the telephone company. According to statements made by the telephone officials, only 40 of about 563 broadcasting stations are operating under license from the telephone company. The suit against WHN is in the nature of a test case to determine if all stations must procure a license in order to continue operations. The contest in the suit is being backed by the Radio Broadcasting Society of America, an association of independent broadcasters. Mr. Schubel, one of the defendants, is president of this society.

On March 11, hearings were held before the committee on merchant marine in congress to consider recommendations for new radio legislation made by Herbert Hoover, Secretary of Commerce. The White radio bill, which is under consideration, aims to prevent a monopoly of radio communication, grants power to the Interstate Commerce Commission to review the rates charged and lays down regulations governing the issuance of licenses by the Department of Commerce. Among those who appeared at the hearing were Raymond Sasseron, representing the City of New York; Paul Klugh, representing the National Broadcasters' Association; Sylvio Hein, a music publisher; Edwin H. Armstrong, E. S. Wilson and W. E. Harkness, vice-presidents of the American Telephone and Telegraph Co.; David Sarnoff, of the Radio Corporation of America, and Major J. A. Mauborgne, of the U. S. Signal Corps.

Floydada, Texas.—A. A. Bailey, of Plainview, has succeeded E. L. Curb as plant manager of the Floydada Exchange of the Southwestern Bell. Mr. Curb has been assigned to Lubbock.

Caldwell, Kans.—A mutual company has been organized here. Thirty-eight business men have taken stock.

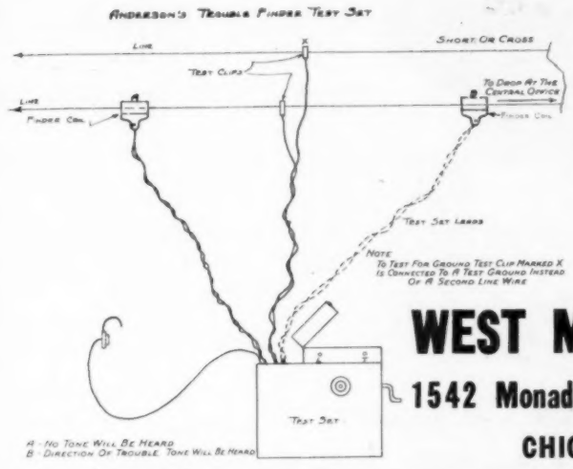
The appointment of W. E. Gosdin as district manager of the Houston properties of the Southwestern Bell Telephone Co. has been announced by W. G. Winters, superintendent of Southeast Texas.

J. M. Baldwin, manager, announces that a new office building will be erected by the San Fernando (Calif.) Telephone & Telegraph Co.

What Is Your Telephone Service Worth To You?

Can you afford to employ out-of-date methods in line maintenance when such important factors as time, circuit revenue and public good will are at stake?

Anderson's Trouble-Finder Test Set adopted into your system will result in substantial savings to you. It is a lineman's portable test set, with a finder coil to locate the trouble. No cutting of the wires necessary. For Toll and Rural Lines; Grounded or Metallic Circuits.


ANDERSON'S TROUBLE FINDER TEST SET
LINE
X
SHORT OR CROSS
TEST CLIPS
TO DROP AT THE CENTRAL OFFICE
LINE
FINDER COIL
FINDER COIL
TEST SET LEADS
NOTE
TO TEST FOR GROUND TEST CLIP MARKED X IS CONNECTED TO A TEST GROUND INSTEAD OF A SECOND LINE WIRE
TEST SET
A - NO TONE WILL BE HEARD
B - DIRECTION OF TROUBLE. TONE WILL BE HEARD

Every day you are without these money-saving test sets you may be paying for it in losses. Get in touch with us today.

WEST MFG. CO.
1542 Monadnock Building
CHICAGO

Brand Your Poles NOW

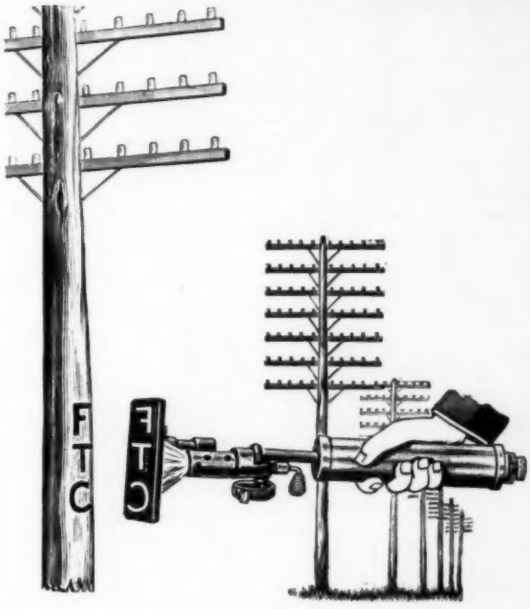
BRAND your new poles and crossarms while they are in the yards. This protects you against confusion as to ownership when they are delivered, ready to raise; at the same time, it marks your poles for future identification.

Brand your standing poles with company name and identification number, which make it easy to issue working orders telling linemen where to work.

Brand all your working tools and equipment to prevent intentional theft or unintentional appropriation.

The need you have felt for many years for an inexpensive, efficient and simple branding iron that would do the above branding work quickly, is answered in Everhot branding equipment. It is especially adapted for use in branding the kinds of equipment mentioned in this ad, and illustrated in the border.

You will be surprised to find out the low cost of Everhot branding equipment, and also surprised at the low cost of branding, due to the rapidity with which the Everhot works.



EVERHOT
America's Brand Makers
EVERHOT MFG. CO., Maywood, Illinois

WHY DON'T YOU?

Large number of operating Telephone Companies use this Cross Arm Arrester

Stops Loss of Cable Pairs

202

Use two or three ahead of Cable Terminal. It pays

NO. 202—SELF-CLEANING SAWTOOTH LIGHTNING ARRESTER STOPS OPEN WIRE LEADS FROM CARRYING DISRUPTIVE CURRENTS INTO CABLES

Reliable Electric Company

3145 CARROLL AVENUE, CHICAGO, ILL., U. S. A.

An Itemized Bill Taken with a Public Service Moral

Columbus, Ohio.—In impressing upon its public the low charges of its particular public utility considering the service rendered, the Ohio Fuel Gas Co. is using an advertisement headed, "——And the doctor charged TEN DOLLARS!!!," which can be very readily and effectively applied to telephone company advertising. The gas company copy reads:

"Down in Texas they tell the story of the time Doctor Brown sent a bill for ten dollars to the terrible-tempered Mr. Bingo Bangs.

"The bill read:

2 visits $10.00

"Bingo Bangs rushed to the doctor's office and fairly shouted:

"'Your're a robber! Think of it, five dollars a visit! It isn't worth it.'

"'Well, I'll rewrite it,' said old Doc. Brown.

"Bangs smiled a knowing smile. They couldn't put anything like that over on Bingo Bangs.

"The doctor wrote:

"'To getting out of bed at 2 A. M.; answering phone; disturbing wife; dressing; going to garage; cranking "tin Lizzie"; two-mile drive in the cold; SAVING BABY'S LIFE; return to garage; waking wife; undressing; getting back into bed—ten dollars.'

"He said to Mr. Bangs: 'I won't make any charge for the second visit and you need not pay for the first unless you feel I have earned the money.'

"Mr. Bangs paid the bill.

"Sometimes we don't pay willingly because we don't realize just what we get for our money.

"It would take a big sheet of paper and much time to itemize the many kinds of service that go into the making of the total bill for natural gas. From the far-off wells to your gas appliances covers a history of service that would read like a romance of fiction and adventure. The thousand and one items of expense alone would make your gas bill look like taking money from Santa Claus. The only wonder would be how such service can be supplied at such low rates.

"And in the little story we did not tell how Dr. Brown was able to instantly get hot water and heat because natural gas was available in the Bangs' home.

"That had much to do with saving baby's life—what value would you put on such service?"

"Number Only" Toll Plan Extended in New England

New Bedford, Mass.—The New England Telephone and Telegraph Co. has installed a new method of handling toll calls between points in Southeastern Massachusetts. This is the "number only" or "no delay" method. The telephone subscriber gives the distant station number to the local operator, who relays the number to an outward toll operator over a special order wire. The subscriber stays on the wire until the connection is completed. Only a skeleton ticket is made out and the services of the recording operator are dispensed with on this type of call. On particular person calls, the regular method of switching the calling party through to the recording operator is employed. The operation by the new method was made possible by the installation of a new toll cable connecting Boston with New Bedford, Providence, Fall River and other points.

Libby, Mont.—E. R. Hannibal, general superintendent Interstate Utilities Co., Spokane, Wash., and E. D. Brink, district superintendent Coeur d'Alene, Ida., plan extensive improvements in the local telephone system. The First State Bank will erect a building at the rear of the bank building for the telephone company.

free—

This booklet will show you how to save money in laying your underground conduit. Send for it today.

—for permanence— this pressure creosoted Conduit

IN THE streets of Philadelphia there is today wooden creosoted conduit which has been in service for over 42 years. Dug up in 1907, when the sub-way was being built, 25 years after it was laid, this conduit was pronounced as good as new by the engineer in charge and was replaced.

Creo-pine pressure creosoted conduit is made of selected Southern yellow pine, free from any defects that would impair its usefulness. 4½″ square with a 3″ bore through center; mortise at one end and tenon at the other.

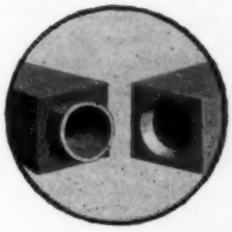
Creo-pine conduit is easy to handle and can be laid with rapidity by unskilled workmen. It requires only a narrow ditch.

Creo-pine conduit is used by the largest telephone and telegraph companies in America and is generally regarded as the standard of comparison.

Our facilities for supplying pressure creosoted telephone poles and cross arms are unexcelled. Quotations gladly furnished.

A few of the Big-Quantity Users of Creo-pine Conduit

American Telephone & Telegraph Co.
New England Telephone Co.
New York Telephone Co.
Southern Bell Telephone Co.
Cumberland Telephone Co.
Western Union Telegraph Co.
Postal Telegraph-Cable Co.
Mackay Telegraph-Cable Co.
N. Y., N. H. & H. Ry. Co.
Brooklyn Edison Co.
U. S. Army Signal Corps.
Engineering Departments of many cities and city alarm systems.



Creo-pine

Trade Name Reg.

CONDUIT

TELEPHONE POLES AND CROSS ARMS

Southern Wood Preserving Co.

Atlanta, Georgia

New York, Philadelphia, Pittsburgh, Buffalo, Cleveland, Toledo, Charlotte

Creosoting and Creo-pine Products

SEND FOR FREE BOOKLET

Southern Wood Preserving Co., Atlanta, Georgia

Gentlemen:—Kindly send me without obligation your booklet describing Creo-pine Conduit, together with information about your pressure creosoted poles and cross arms.

Name .....

Title .....

Address .....

State Staff for Texas

Annual Convention Plans Advisory Service

President, R. B. Still, general manager Gulf States Telephone Co., Tyler.

Vice-president, F. W. Greber, general manager, West Texas Telephone Co., Brownwood.

Vice-president, J. B. Earle, president, Texas Long Distance Telephone Co., Waco.

Vice-president, J. Y. Rust, president, San Angelo Telephone Co., San Angelo, Texas.

Secretary, L. S. Gardner, secretary, Texas Telephone Co., Waco.

Treasurer, D. J. Johnson, general superintendent, West Texas Telephone Co., Brownwood.

Fort Worth, Tex.—More than three hundred Texas telephone men and operators and supply men hung up a new attendance record at the nineteenth annual convention of the Texas Independent Telephone Association.

The big feature of the meeting was the acceptance of the plan for an advisory staff, proposed by R. B. Still of Tyler, who was made president of the organization for the ninth term. During his presidential address Mr. Still mentioned the importance of the public service motive which dominates the actions of the state's industry, the legislative protection afforded by the association's committee and the betterment effected by the various state and district meetings of the organization.

Advisory Plan

He registered strongly on the plan for the creation of a staff to work with the officers of the association, the staff to be composed of small committees of not more than three members each. He suggested a committee of toll traffic, a committee on engineering and construction, a committee on commercial and accounting problems, and a committee on legal questions.

Duties of these committees shall be: (a) To meet and study the problems and questions affecting Independent telephony in our state; (b) to work out and recommend to the board of directors and officers, plans and methods of serving the association membership; (c) advising with the active officers from time to time on matters for which the various committees are responsible; (d) studying and assisting with problems and questions submitted by individual company members; (e) working with the officers in planning district meetings and annual conventions; (f) acting with the directors and officers in an advisory capacity at various meetings when problems or questions on these various points are up for consideration and when their advice would be of advantage; and (g) advising with members on various questions at district meetings and annual conventions, so as to make these gatherings of the very most value possible to the membership.

Mr. Still recommended that if this staff is created, it be not required to carry on correspondence directly with the membership in answering questions and considering problems, but that member companies have the right to propound questions and submit their problems through the secretary's office in order to facilitate the handling and to at all times keep in the secretary's office the questions and the decisions and the general information that would there be supplied.

This arrangement, he thought would be a workable one and, by having all correspondence handled through the secretary's office, it would be found that many questions have already been answered and decisions made, hence we would save the duplication of work and unnecessary activity of the committees.

Mr. Still further recommended that the association arrange with these committees for special services for any member company, such as appraisal of property, study of traffic problems engineering and laying out plans for construction, accounting and commercial services, and legal services.

"It is not my idea that the members of these committees go into the field and do the work themselves but that they use their efforts toward providing talent for such assistance as the members might call for," he stated.

"Square Deal" Relations Formula

Satisfactory public relations are built on a proper selection of employees and the square deal to all with whom the utility comes into contact, summarized George McQuaid, director of the Texas Public Service Information Bureau in his well received address on public relations.

Suggestions for improving the service of the association to its members were advanced in a talk made by Sam H. Schutt, general supt. of the Texas Long Distance Telephone Co. Another array of profitable suggestions was advanced to the convention by J. B. Whiteman of the West Texas Telephone Co. who spoke on collections.

Managerial tact was emphasized as the foundation of pleasant and profitable relations between the manager and the public in the remarks made by A. H. Snead, manager of the Texas Telephone Co.

A history of utility regulations was presented in an interesting and informative manner by Walter Splawn of the Texas Railway Commission. He said that a move would be made at the next meeting of the Texas legislature for a utility commission.

That the merits of state regulation outweigh its defects was the judgment passed during the address of H. W. Hubenthal, engineer of the Oklahoma Utilities Association, who spoke from an intimate knowledge of his subject.

The field for telephone company profit from radio was defined by H. N. Faris of the Kellogg company, who recommended that some bright high-school lad or partially disabled soldier be placed at the head of the telephone companies' radio department, and with proper supervision and employment of the telephone companies' facilities and buying power, the public soon will recognize the company as the place to come for real radio service.

Lon A. Smith, state comptroller of Texas, spoke on taxation with particular stress laid on the taxation problems of telephone companies. Assaying ideas for something of real advantage to the telephone company supplied E. H. Egan of the People's company at Denton with a subject of considerable interest to the many managers present.

C. C. Deering, secretary-treasurer of the U. S. I. T. A., spoke on the advantages held forth in participation in association activities.

O. W. Ficklin, plant superintendent for Texas, has been named general plant manager for the entire Southwestern Bell Telephone system, effective March, and has removed from Dallas to St. Louis, Mo.

Coos & Curry Telephone Co. has contracted for the construction of a building in Marshfield, Ore., to cost $150,000.

Jerseyville Telephone Co., Inc., 108 S. Washington st., Jerseyville, Ill., has been incorporated to manufacture and deal in electrical and mechanical devices, and handle electrical and telephone instruments and equipment. Incorporators: Harriet Shepard, J. C. Schwartz and J. M. Page.

Southern Illinois Telephone Co., which recently succeeded the Murphysboro Telephone Co., announces that a fund of $2,000,000 will be spent the coming five years for betterments and extensions for its several exchanges in Southern Illinois.

What other pliers can stand the g a m e? What o t h e r pliers have the right spring and curve to the handles — just the right temper to the knives —just the fine materials and manufacture that you expect and get in a Klein plier!

Buy them for *your* linemen.

Mathias Established 1857 KLEIN & Sons Chicago Ill USA

THOMAS QUALITY — RELIABILITY

INSULATORS

In the Power and Lighting markets our product has successfully made our name the "buy word" in electrical porcelain.

Thomas Quality

defines a structure of porcelain that is hard, well fired, impervious to moisture and provides unparalleled strength mechanically. For well over a quarter century we have concentrated an expert force of engineering talent and exceptional plant facilities on the production of Insulators of the "superior" kind.

One branch of our business has been to maintain ample stocks of modern telephone insulators ready for the immediate call of the trade. Prompt shipments can be assured at all times, whether your requirements call for barrel or carload lots.

Your name entered on our mailing list will insure your receiving valuable literature as issued.

THE R. THOMAS & SONS CO.
EAST LIVERPOOL, OHIO
U. S. A.

NEW YORK CHICAGO BOSTON

Northern Electric Company in Canada

Service tells the story

SERVICE determines the value of every unit in your plant and few units, if any, are called into play more frequently, or are handled more roughly, than your switchboard cords. The service of

RUNZEL-LENZ

Moisture-Proof Tinsel

SwitchboardCords

invariably tells a story of economic efficiency that has convinced hundreds of exacting cord buyers.

Do You Need Cords NOW?

RUNZEL-LENZ ELECTRIC MANUFACTURING CO.
1751-1757 N. Western Ave., Chicago

STANDARD UNDERGROUND CABLE CO.

STANDARD Telephone Cables

are guaranteed as to their unexcelled dependability by long and successful service.

They represent the greatest advancement in telephone cable manufacture.

Write our nearest office about your requirements

Standard Underground Cable Co.

Boston, New York, Washington, Philadelphia, San Francisco, Detroit, Chicago, St. Louis, Pittsburgh

"STEWART" CABLE TESTER

Locates shorts, grounds, crosses and wet spots to an inch. The only practical tester for locating water trouble.

Write for circular today and be ready for trouble which is sure to come. Sent on trial.

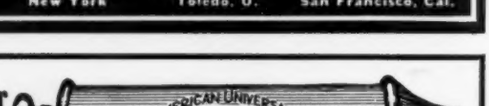
Also test sets, test cabinets and detecto meters

STEWART BROTHERS, Ottawa, Ill.

WESTERN **CEDAR POLES** NORTHERN
TREATED or PLAIN
PENTREX A SPECIALTY
NATIONAL POLE CO., Main Office: Escanaba, Mich.
BRANCH OFFICES 220 Broadway New York; 2844 Summit Street Toledo, O.; Rialto Building San Francisco, Cal.

CEDAR POLES
NORTHERN ✣ WESTERN
BUTT-TREATING - GUARANTEED GRADES
ANY SPECIFICATIONS REQUIRED
BELL LUMBER CO., Minneapolis, Minn.

Cylinder Bellows



Indispensable for cleaning switchboards and electrical machinery. Will not short circuit. Powerful air pressure removes dust from inaccessible places which cannot be reached with a cloth or brush.

For sale at all electrical supply dealers

P. PEIFFER 80 Liberty Street Newark, N. J.

Northern White **CEDAR POLES** Western Red

QUICK DELIVERY
PRICES AND QUALITY SATISFACTORY

J. J. SEGUIN
579 Saint John Street QUEBEC CITY, P. Q., CANADA

"REBUILT" TELEPHONE APPARATUS and exchange equipment saves you 30 to 50 per cent without sacrificing quality or efficiency.
SWITCHBOARDS—Telephones—Apparatus—Protection Equipment—Cable—Everything you need for the installation and operation of a complete exchange—Magneto or Central Energy—of the best and most reputable manufacturers.
Fourteen years' successful operation of our rebuilt equipment department puts it past the experimental stage. Quality and price will make you a permanent customer. Better investigate.
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Plan Manchurian L. D. Line Under French and Chinese Control

Harbin, Manchuria — The scheme proposed by M. Lepissier, French Consul here, for the construction of a long-distance telephone line in Manchuria under Sino-French control has been approved, and a company is in progress of formation. The new line is to start at Pogranichnaya, on the borders of North Manchuria and Siberia, running westward to Manchouli, the western terminus of the Chinese Eastern Railway. In time, it is to connect with Vladivostok on the east, and Chita on the west. The new company is to be capitalized at S. Y. 1,000,000, to be paid up in full between the French and Chinese sides. Sixteen years hence the new telephone system is to pass into Chinese hands unconditionally.

The Oklahoma Meeting

A Wealth of Good Features on the Program—New Officers Elected

A telephone man was named president of the Oklahoma Utilities Association at the sixth annual convention at Oklahoma City, March 11-13. He is John W. Walton, owner of the Broken Arrow Telephone Exchange, former chairman of the telephone division of the association. Other officers are: R. C. Sharp, Tulsa, general manager Oklahoma Natural Gas Co., vice-president; Frank B. Hathaway, Oklahoma City, of the General Electric Co., second vice-president; W. R. Emerson, Oklahoma City, Oklahoma Gas & Electric Co., treasurer; Edward F. McKay, Oklahoma City, manager; O. D. Hall, Oklahoma City, assistant manager; Miss Kate Niblack, Oklahoma City, assistant treasurer. Co-operation between the state's utilities was forecast by election of J. P. Gibson, president Western Telephone Co., of Elmore City, and also president of the Oklahoma State Bankers' Association, as the telephone division member of the executive board. L. E. Thrasher, of the Oklahoma-Arkansas Telephone Co., Poteau, Okla., was chosen as division chairman to represent the telephone interests. Interesting addresses were made by H. W. Hubenthal, the association's telephone engineer; by J. W. Walton, of Broken Arrow; Sherman Mooter, of Hanna; Dr. C. W. Briles, Chas. C. Deering, W. S. Vivian, Douglas Malloch, Sophia Malicki, B. Richardson, E. B. Jennings, L. W. Scherer, J. M. Nelson, E. C. Patton, M. Flickinger, J. M. Allen, J. P. Gibson, Geo. Massey and Harry N. Faris.

Florida Association Re-Elects Its Old Officers

At St. Petersburg, March 6-7, the Florida State Telephone Association reelected its old officers, as follows: W. G. Brorein, Tampa, president; Dr. W. L. Moor, Tallahassee, vice-president; Frank Moor, Tallahassee, secretary and treasurer. Interesting addresses were made by President Brorein, F. B. MacKinnon, J. M. B. Hoxsey, A. B. Steuart, David Laird, F. W. Webster, Otto Wettstein, J. F. Vaughan, W. U. Lathrop, W. H. Adkins and others.

R. E. Dutcher, owner of the Pierce (Nebr.) Independent Telephone Co., will install 2,000 feet of underground cable this year and 8,000 feet of cable in asphalt. He is in the market for from five to ten tons of asphalt.

San Benito (Tex.) Telephone Co. will make extensive improvements to its rural telephone lines.

Kansas Holds Annual Meeting and Election

The Junction City meeting of the Kansas Independent Telephone Association, March 5-6, elected the following officers:

President, T. L. Youmans, Osawatomie; vice-presidents, A. J. Stevens of Hiawatha, Bruce Goff of Wakeeney, and J. A. McDonald of La Harpe; treasurer, H. L. Harris, Kansas City; assistant treasurer, M. J. Hancock, Kansas City; and secretary, L. M. Kraege, Topeka.

Executive committee—J. A. Gustafson, Fredonia; J. H. Campbell, Baldwin; H. L. Harris, Kansas City; Foster Lanning, Tonganoxie; Samuel Tucker, Pleasanton; Fred Coulson, Abilene; C. C. Raymond, Greensburg; and R. B. Fegan, Junction City.

Membership secretaries—E. L. Boyle, Independence; E. C. Umdenstock, Osage City; H. J. Clark, Ashland; and F. E. Geyer, Waterville.

Among the speeches were those of H. E. Eldridge, J. P. Coleman, Judge C. E. Rugh, H. N. Faris, Gen. E. L. King, Paul Grady, Dr. F. W. O'Donnell, C. C. Deering, C. J. Larsen and John H. Ainsworth.

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Here Are the Heroes of Illinois Bell for 1923

Illinois Bell Telephone Co. employees awarded Theodore N. Vail Medals for noteworthy public service in 1923, are as follow:

Miss Elizabeth Byrnes, supervisor in the Oak Park office. In the midst of heavy New Year's eve traffic, a toll call was referred to her by an operator. A woman, gasping for breath, when called back did not answer. The called party, a son of the woman, expressed no alarm, but Miss Byrnes located an acquaintance of the woman, who went to the house and found the woman had died of heart failure. A small grandson was alone with her.

William Jones and John Costello, linemen, stopped a team of runaway horses in Antioch June 20. Each man jumped for a horse and brought them to a halt before they reached the business section, thus preventing possible damage to property and injury to persons.

Henry W. Radius and Robert T. Hattendorf, installers, assisted a man and boy from a ditch where they had been thrown from an overturned automobile, and took another boy from beneath the car, unconscious. Artificial respiration was resorted to, and all were saved.

Hewitt B. Garvey, transmission testing foreman, rescued two women trapped on the third floor of a burning building in New York City, and also rescued two women bathers from drowning at Farwell Ave. beach, Chicago.

Henry L. Warner, plant man, Chicago, and his brother rescued three men and three women from drowning in Lake Zurich, July 4.

Michael Sansone, building repairman, discovered a fire, turned in an alarm and carried out two boys, three and five years old. He then returned for a third child, but she had reached the street.

Howard B. Matteson, plant man, Morris, Ill., raised an automobile which had skidded and overturned in a ditch, applied artificial respiration and a man who had been pinned under the car began breathing naturally in about twenty minutes.

Athens (Tex.) Telephone Co. will have a new $100,000 plant—new poles, wires, cables and an up-to-date switchboard.

Eagle River, Wis.—Sufficient stock has been subscribed to guarantee construction of a telephone system from State Line to this city, touching Rummeles and Conover. A line from the Jackson system to Sayner also is contemplated.

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Do Every Operation in Minimum Time
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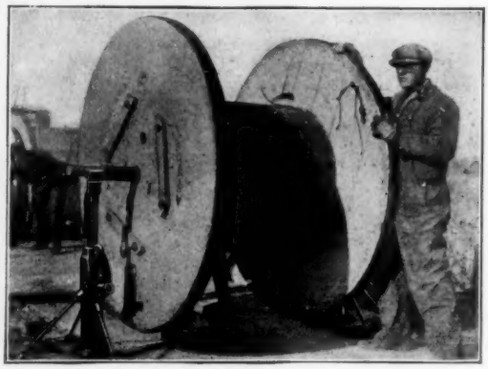

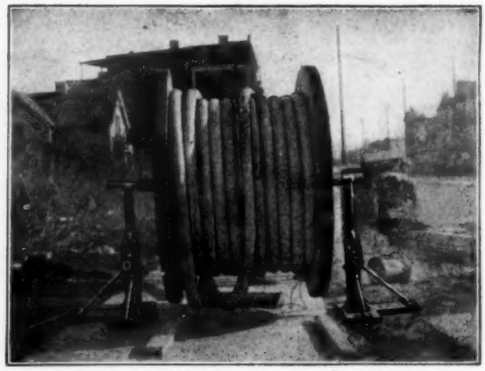

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From Start to Finish of a Cable Pulling Job, the multiplied man power of quick acting Simplex Cable Reel Jacks save time and money at every step.

You can be sure that Simplex Cable Reel Jacks will not tip over from an accidental side pull, thereby wasting time, damaging the cable or injuring employees.

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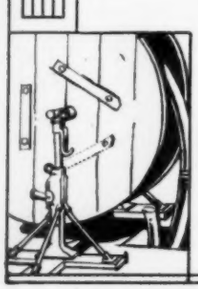

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You can readily afford BRACH Vacuum Arresters at our present low prices. Type 440, shown above, is furnished with porcelain base, fuses and mountings.

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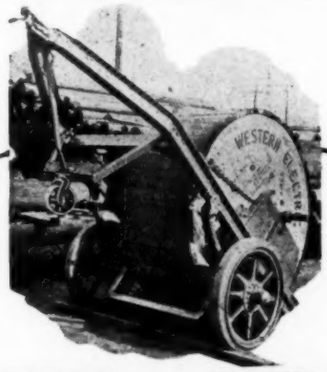

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After all is said and done the value of any device or appliance used in commercial work is commensurate with the ease and ability with which it meets the practical man's requirements. National Telephone Construction Specialties maintain satisfied customers because linemen are kept satisfied.

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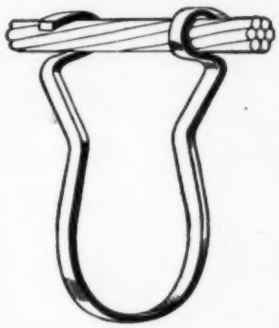
For drop wires, these knobs can be installed in one-half the time taken by old-style rigid insulators. Their flexibility preserves the life of the drop wire and allows the lineman to pull the slack at any angle.



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Here's the Kind of Friends to Have—The Editor "Bats Up"

Middletown, N. Y.—Officials of the Orange County Telephone Co. believe that, taking one consideration with another, a telephone man's lot is a happy one. They came to this conclusion after reading the lead editorial in Middletown's Daily Herald, a power in those parts. The editor, after commenting on the telephone's service to the American advance, says:

"Do the people of Middletown know that here we have probably the best telephone service in America? This writer has had occasion to use the telephone in many places since America entered the world war, and in Middletown the service is better than anywhere else within the range of his experience. Not only is the service better here, but the cost is lower than in any exchange of like size in this country.

"We all know how enormously rents have increased, what the increase has been in wages, and every other living cost, and yet, the Orange County Telephone Company, with a much larger exchange, with a greatly increased operating expense; with replacements costing vastly more than in the pre-war period, is still compelled to operate for the same charge that it received in a period when the exchange was much smaller, and the cost of operation and maintenance vastly less.

"There can be but one result in holding down any utility to a charge below that needed to pay a reasonable profit—and that would be ruin to that utility.

"Our telephones in Middletown save us millions yearly, besides making life much more comfortable. Can we afford to allow a condition to exist which would ultimately mean confiscation and the loss of very serious impairment of this service?"

Plans Completed for Italian Transfer to Private Owners

Rome, Italy.—Plans relative to the transfer of the Italian telephone system to private enterprise have been completed, and printed copies of the plan have been released to those interested in any way in the undertaking, by the Minister of Posts and Telegraphs.

J. A. Steninger, of Parker, Ia., owner of the Steninger Telephone Co., has bought the Davis exchange of the Northwestern Bell Telephone Co. He also owns the exchanges at Hurley, Monroe and Parker.

John E. Chambers of Seymour, Ind., is the new manager of the Henderson (Ky.) Home Telephone Exchange.

William Bradford, manager of the Williamsport (Pa.) sub-district of the Bell Company, has become manager of the Altoona (Pa.) district of the company.